CLINICAL PROFILE OF NON-ALCOHOLIC FATTY LIVER DISEASE AND NONINVASIVE ANALYSIS OF NAFLD FIBROSIS SCORE AMONG TYPE 2 DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL

Dissertation Submitted for

D.M. DEGREE EXAMINATION
BRANCH IV - MEDICALGASTROENTEROLOGY

STANLEY MEDICAL COLLEGE

and

GOVERNMENT STANLEY HOSPITAL
CHENNAI – 600 001

THE TAMILNADU
DR. M.G.R. MEDICAL UNIVERSITY CHENNAI

AUGUST– 2014

CERTIFICATE

This is to certify that the dissertation entitled **– "CLINICAL PROFILE OF NON-ALCOHOLIC FATTY LIVER DISEASE AND NONINVASIVE ANALYSIS OF NAFLD FIBROSIS SCORE AMONG TYPE 2 DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL"** is the bonafide original work of **Dr.S.SATHIAMOORTHY** in partial fulfillment of the requirements for D.M.Branch IV(MEDICAL GASTROENTEROLOGY) examination of THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY to be held on August 2014. The period of post graduate study and training was from August 2011 to July 2014.

Prof. Dr.A.R.VENKATESWARAN,
MD., DM
GUIDE
PROFESSOR & HOD OF MEDICAL GASTROENTEROLOGY
STANLEY MEDICAL COLLEGE & HOSPITAL, CHENNAI – 600 001.

Dr. A.L.MEENAKSHI SUNDARAM,
MD., DA,
DEAN,
STANLEY MEDICAL COLLEGE & HOSPITAL,
CHENNAI – 600 001.

DECLARATION

I **Dr.S.SATHIAMOORTHY**, solemnly declare that this dissertation entitled **– "CLINICAL PROFILE OF NON-ALCOHOLIC FATTY LIVER DISEASE AND NONINVASIVE ANALYSIS OF NAFLD FIBROSIS SCORE AMONG TYPE 2 DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL"** is the bonafide original work done by me at the Department of Medical Gastroenterology, Stanley Medical College and Government Stanley Hospital during the period 2011-2014 under the guidance and supervision of the Professor and Head of Department of medical gastroenterology of Stanley Medical College and Government Stanley Hospital, **Prof. Dr. A. R. VENKATESWARAN, M.D., D.M.,** This dissertation is submitted to THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY, towards partial fulfillment of requirement for the award of D.M. Degree (Branch - IV) in Medical Gastroenterology.

Place : **Dr.S.SATHIAMOORTHY**

Date :

ACKNOWLEDGEMENT

To begin with, I thank God almighty for all grace He has bestowed upon me. This dissertation is the culmination of the help, encouragement and guidance from a number of people; I would like to thank them all.

I wish to express my sincere thanks to Prof **Dr.A.L.MEENAKSHI SUNDARAM, MD., DA., Dean,** Stanley Medical College & Hospital for having permitted to proceed with my dissertation as the chairman of the ethical committee and the encouragement provided, for allowing me to avail the facilities in the hospital for the conduct of this study.

I am profoundly grateful to **Prof. Dr. A.R.VENKATESWARAN, M.D., D.M,** Prof & Head of the Department, Medical Gastroenterology, Govt. Stanley Hospital, Chennai for his constant encouragement,and unstinted co-operation which helped me at every stage of this dissertation andvaluable guidance in preparation and completion of this study.

I also wish to convey my respect and earnest gratitude to **Prof. Dr.M.S.REVATHY, M.D., D.M.,** Associate Professor of Medical Gastroenterology for her valuable guidance and encouragement.

I express my gratitude and thank all my assistant professors **Dr. M. MANIMARAN, Dr. R. MURALI, Dr. M. MALARVIZHI, Dr. S. CHITRA,** for their guidance and extreme support in this study.

I am deeply indebted to all the Professors and tutors of other collaborating departments for their able help and support especially **Dr.C.AMARNATH, M.D., R.D., F.R.C.R**., Prof. & Head of the Department of Radiodiagnosis, Government Stanley medical college, for helping to complete ultrasound imaging for all my patients.

I also wish to thank **Dr.SARAVANAN**, the then Prof. & HOD and **Dr.LALITHA** the present Prof and HOD of the Department of Biochemistry, Government Stanley medical college for helping me to do laboratory investigations for all my patients.

I also wish to thank the Department of Hepatology, Madras medical college, **Dr. NARAYANASAMY MD, DM,** Prof. & Head of the Department of Hepatology and his Assistant Professors **Dr.CHEZHIAN, M.D., D.M.,** and **Dr. SENTHIL, M.D., D.M.,** for doing Fibro Scan for my study subjects.

I wholeheartedly thank my seniors and junior colleagues, without whose direct or indirect help this work would not have been possible.

I thank the Ethical Committee for the approval of my study and I Statistician Mr. RAVANAN, Lecturer of Bio-Statistics.

Last but not least, I thank all the patients who took part in my study to make it a fruitful one and their relatives for all the support lend.

TABLE OF CONTENTS

ABBREVIATIONS

NASH	-	Non Alcoholic Steato Hepatitis
NAFLD	-	Non Alcoholic Fatty Liver Disease
T2DM	-	Type 2 Diabetes Milletes
NFS	-	NAFLD Fibrosis Score
AUROC	-	Area Under Receiver Operator Curve
HCC	-	Hepatocellular Carcinoma
CT	-	Computerized Tomography
MRI	-	Magnetic Resonance Imaging
BARD	-	BMI,AST/ALT Ratio, Diabetes
AST	-	Aspartate Transaminase
ALT	-	Alanine Transaminase
ARFI	-	Aquostic Radiation Force Impulse
IGT	-	Impaired Glucose Tolerance
IFG	-	Impaired Fasting Glucose
NGT	-	Normal Glucose Tolerance

TNF	-	Tumor Necrosis Factor
BMI	-	Body Mass Index
FFA	-	Free Fatty Acids
VLDL	-	Very Low Density Lipoprotein
IBD	-	Inflammatory Bowel Disease
SAP	-	Serum Alkaline Phosphatase
GGT	-	Gamma Glutamyl Transpeptidase
PPV	-	Positive Predictive Value
NPV	-	Negative Predictive Value
HCV	-	Hepatitis ‘C’ Virus
NCEP ATP	-	National Cholesterol Education Programme, Adult Treatment Panel
TGL	-	Triglyceride
HDL	-	High Density Lipoprotein
ANOVA	-	Analysis of Variance

INTRODUCTION

REVIEW OF LITERATURE

AIM OF THE STUDY

METHODS AND MATERIALS

OBSERVATION AND RESULTS

DISCUSSION

CONCLUSION

BIBLIOGRAPHY

ANNEXURES

MASTER CHART

INTRODUCTION

NAFLD is considered as commonest liver problem of the western world where about 15-40% general population are affected. NAFLD stands as second and fourth cause for liver transplantation in large transplantation centres and in the United States, respectively. Approximately 20-30%and3-10%of Western adults and children are suffering from NAFLD and this value reaches up to 70-80% in the obese population[1]. NAFLD has attained epidemic proportions even in countries at low risk, such as China (15%)and Japan (14%). This alarming increase in NAFLD is because NAFLD progresses from liver failure to cirrhosis to HCC. Many factors contribute to develop NAFLD including diabetes mellitus (T2DM) which can increase its risk and severity. Peripheral insulin resistance is a central mechanism for the pathogenesis of both entities.

10-75% of NAFLD patients have T2DM and 21-72% of diabetic patients are found to have NAFLD[2]. The mortality rate in diabetic patients due to cirrhosis is above 2 times the general population and patients with NAFLD and DM have poorer prognosis in terms of higher rates of cirrhosis and mortality. NAFLD and T2DM are conditions highly dependent on genetic background and dietary factors[3].

NAFLD is a spectrum with, simple steatosis (which remains stable over a period of years without progression in most patients) to steatohepatitis and advanced fibrosis (more risk for developing decompensated liver disease with portal hypertension to HCC, or death unless transplantation is done).

Hence they need close follow-up and surveillance for esophageal varices and HCC and if required treatment.

Liver biopsy is gold standard to identify steatohepatitis and fibrosis in NAFLD patients, but has several limitations such as cost, sampling error, procedure-related morbidity and even mortality. Liver enzymes and imaging (ultrasound or CT or MRI) will not exactly assess steatohepatitis and fibrosis in these patients. Much interest developed for non-invasive analysis using clinical prediction tools and biomarkers to identify steatohepatitis and significant fibrosis.[4]

NAFLD Fibrosis Score (NFS) , BARD, AST to Platelet Ratio Index (APRI), and FIB-4 are the more widely investigated noninvasive tools to cross-sectionally predict advanced fibrosis in NAFLD[5]. NAFLD Fibrosis Score consists of six variables (BMI, Age, hyperglycaemia, platelet count, AST/ALT ratio , Albumin) and very useful clinical tool for

detecting advanced fibrosis (bridging fibrosis and/or cirrhosis) with higher likelihood in NAFLD patients.[6]

AUROC for NAFLD Score is 0.85 in predicting advanced fibrosis. The Score of≤1.455 had sensitivity of90% and specificity of 60% to exclude advanced fibrosis and the score of> 0.676 had sensitivity of 67% and specificity of 97% to detect advanced fibrosis.[4]

An algorithmic approach in NAFLD was Proposed in an international study recently. According to that study, patients with a lower NAFLD score below the cut-off level found to have a low risk for significant fibrosis and disease progression and they can be managed safely in a primary care.

If the score is in the indeterminate or high range referral to a specialist care is indicated. These patients are investigated further by non invasive modalities such as specialised scan ssuch as Fibroscan (Transient Elastography) /ARFI (Aquostic Radiation Force Impulse imaging) or with serum markers for steatohepatitis. Liver biopsy should only be done for those patients where non-invasive tests are inconclusive. The serum marker panels can replace Fibroscan in this algorithm later.[6]

AIMS AND OBJECTIVES

1. To study the prevalence of Non-alcoholic fatty liver disease based on ultrasound and study its clinical profile in type 2 diabetic patients attending outpatient clinic and inpatients in the Stanley medical college Hospital.

2. To apply the simple non invasive scoring system (NAFLD FIBROSIS SCORE) which helps in separating NAFLD patients with and without advanced liver fibrosis by using clinical and biochemical variables.

3. To correlate the NAFLD Fibrosis score (Indeterminate and high risk) in patients with high grade fatty liver (ultrasound) with the liver stiffness measured by transient elastography (FIBROSCAN) .

REVIEW OF LITERATURE

HISTORIC PERSPECTIVE:

The liver and fat storage, derived from the Latin term for liver, **ficatu,** and the corresponding greek term, **sycoti-** common name for fattened animal livers, **iecaur ficatum and hepar sykoton.** [9] Macrovesicular steatosis with inflammation and fibrosis in the liver of obese subjects was known several decades ago [10] . Ludwig et alin 1980,coined a term NASH in non-alcoholics on the similar histological findings in alcoholics. [11]

The research into etiopathogenesis, natural history, diagnosis and treatment of NAFLD/NASH started in a Chronological order as follows[12]

1950	• Cirrhosis noted in diabetics
1970s	• Jejuno-ileal bypass liver disease resembles alcoholic hepatitis
1979/80	• Ludwig *et al.* [1] Coined term NASH for steatohepatitis in non-drinkers
	• ~8 papers/year
	• Small series
	• NASH is benign (Powell *et al.* 1990 [8])
1994	• Expanded scope of NASH (Bacon *et al.* 1994 [10])
1996	• CYP2E1 induced in rodent dietary model
	• Endotoxin induces inflammation in steatotic liver
1998	• CYP2E1 induced in human NASH
	• First NIH conference on NASH
	• Pivotal importance of insulin resistance
1999	• Several animal models
	• First clinical trials
2002	• ~60 papers/year
	• AASLD single topic conference
	• First European and Japanese single topic conferences
	• NASH established as part of insulin resistance syndrome
2004	• Release of first book on NAFLD/NASH

INCIDENCE AND PREVALENCE:

In general population,10-24 % NAFLD was detected in various countries. The estimation increases from 57.5 %[13] to 74 % [14,15] among obese persons. NAFLD is responsible for abnormal, asymptomatic elevation in liver function tests among the blood donors and in 90% cases when no other liver etiology was found.[16] NAFLD prevalence increased in general population due to increased prevalence of obesity and diabetes.

Obesity is seen in 22.5% of people ≥20 years of age .[17] Fatty liver is found in >2/3 of the obese people, irrespective of diabetes[18] and > 90% in people with morbid obesity.[19] Steatohepatitis is seen in about 3% in lean population ,19% in obese population, and almost 50% in morbid obesity people.[18,19]

Indian scenario:

Asian populations prevalence data are very less. **Chitturi et al**[21] found the potential load of NAFLD in Asian-Pacific region as atleast 4,00,000 Australians and 1.8 million Asians had fatty liver. Prevalence of fatty liver was found to be 15.8% and 24%, respectively in an autopsy series from western India and from eastern coastal India .[22,23] Various

studies in India found the insulin resistance and the metabolic syndrome to be about 11- 41%[24] depending on the region and urbanization. In **Mishra et al**[25] study metabolic syndrome and NAFLD are seen in 24% and 14.8%, respectively, in Indian non alcoholic men. In **Mohan et al**[26] study NAFLD (54.5%) was found significantly higher in T2DM patients than with pre-diabetic (33%), isolated IGT (32.4%), isolated IFG (27.3%) and NGT (22.5%).In **Gupte etal**[27] study a symptomatic T2DM patients had mild (65.5%), moderate (12.5%) and severe (9.35%)NAFLD respectively. In **Prashanth et al**[28] study,T2DM patients had more NAFLD and NASH which increased when components in the metabolic syndrome increased . **Banerjee et al**[29] found on histology , fatty change, NASH ,more advanced disease in43%, 40% and 23% respectively. **vikram et al**[30] showed, 1/3rd of the urban residents in metropolitan Indian cities had metabolic syndrome. Insulin resistance is very high in Asian Indians than white Caucasians.[31]

Selected studies on prevalence of NAFLD and NASH[20]

Author (year)	Study	Diagnostic method	Country	No. of individuals screened	Prevalence of NAFLD (%)	Prevalence of NASH (%)
Browning (2004)	Population-based	MR spectroscopy	USA	2287	31	ND
Bedogni (2005)	Population-based	Ultrasonography	Italy	598	23	ND
Fan (2005)	Population-based	Ultrasonography	China	3175	15	ND
Nomura (1988)	Population-based	Ultrasonography	Japan	2574	14	ND
Clark (2003)	Population-based	Aminotransferases	USA	15 676	5.4	ND
Ruhl (2003)	Population-based	Aminotransferases	USA	5724	2.8	ND
Jimba (2005)	Health evaluation	Ultrasonography	Japan	1950	29	ND
Hamaguchi (2005)	Health evaluation	Ultrasonography	Japan	4401	18	ND
Park (2006)	Health evaluation	Ultrasonography	South Korea	6648	16	ND
Hultcrantz (1986)	Hospital series	Liver biopsy	Sweden	149	39	ND
Lee (1989)	Hospital series	Liver biopsy	USA	543	ND	9
Nonomura (1992)	Hospital series	Liver biopsy	Japan	561	ND	1
Byron (1996)	Hospital series	Liver biopsy	USA	1226	ND	11
Daniel (1999)	Hospital series	Liver biopsy	USA	81	51	32
Berasain (2000)	Hospital series	Liver biopsy	Spain	1075	ND	16
Hilden (1977)	Autopsy series	Liver biopsy	Sweden	503	24	ND
Ground (1982)	Autopsy series	Liver biopsy	USA	423	16	ND
Wanless (1990)	Autopsy series	Liver biopsy	Canada	207	29	6
El-Hassan (1992)	Outpatients	Ultrasonography, CT	Saudi Arabia	1425	10	ND
Lonardo (1997)	Outpatients	Ultrasonography	Italy	363	20	ND
Araujo (1998)	Outpatients	Ultrasonography	Brazil	217	33.5	ND
Omagari (2002)	Outpatients	Ultrasonography	Japan	3432	9	ND
Luyckx (1998)	Bariatric surgery	Liver biopsy	Belgium	528	74	ND
Silverman (1990)	Bariatric surgery	Liver biopsy	USA	100	86	36
Dixon (2001)	Bariatric surgery	Liver biopsy	Australia	105	71	25
Beymer (2003)	Bariatric surgery	Liver biopsy	USA	48	85	33
Spaulding (2003)	Bariatric surgery	Liver biopsy	USA	48	88	56
Mathurin (2006)	Bariatric surgery	Liver biopsy	France	167	ND	14.4
Franzese (1997)[a,b]	Outpatients	Ultrasonography	Italy	72	53	ND
Tominaga (1995)[a]	Health evaluation	Ultrasonography	Japan	810	3	ND
Schwimmer (2006)[a]	Autopsy series	Liver biopsy	USA	742	9.6 (38 among obese)	3

[a]Pediatric series. [b]Obese children. ND, not determined.

NAFLD Causes as listed below:[20]

Primary	Obesity, glucose intolerance, type 2 diabetes, hypertriglyceridemia, low HDL (high-density lipoprotein) cholesterol, hypertension
Nutritional	Protein-calorie malnutrition, rapid weight loss, gastrointestinal bypass surgery, total parenteral nutrition
Drugs	Glucocorticoids, estrogens, tamoxifen, amiodarone, methotrexate, diltiazem, zidovudine, valproate, aspirin, tetracycline, cocaine
Metabolic	Lipodystrophy, hypopituitarism, dysbetalipoproteinemia, Weber-Christian disease
Toxins	*Amanita phalloides* mushroom, phosphorus poisoning, petrochemicals, *Bacillus cereus* toxin
Infections	Human immunodeficiency virus, hepatitis C, small bowel diverticulosis with bacterial overgrowth

NAFLD Risk factors:(AASLD PRACTICE GUIDELINES 2012)

Conditions with established association	Conditions with emerging association*
Obesity	Polycystic ovary syndrome
Type 2 diabetes mellitus	Hypothyroidism
Dyslipidemia	Obstructive Sleep apnea
Metabolic syndrome**	Hypopituitarism
	Hypogonadism
	Pancreato-duodenal resection

When severe obesity and diabetes present together, mild steatosis, steatohepatitis and cirrhosis were seen in 100%, 50% and 19% respectively.[32] Asians have more visceral fat than their White counterparts of the same BMI which is highly lipolytic and releases free fatty acids directly into the portal vein.[33].Environmental factors and lifestyle factors such as decreased physical exercise and high dietary fat leads to insulin resistance and NAFLD..

PATHOGENIC MECHANISMS OF NAFLD:

NASH/NAFLD is a genetically determined disease due to its association with diabetes and obesity.[34]Candidate genes in NASH are of four types: Genes that influences steatosis severity, fatty acid oxidation, oxidative stress, effect of TNF. Insulin Resistance is the key pathogenic factor for hepatic steatosis.

FATTY ACID METABOLISM AND LIPOTOXICITY IN THE PATHOGENESIS OF NAFLD/NASH[35]

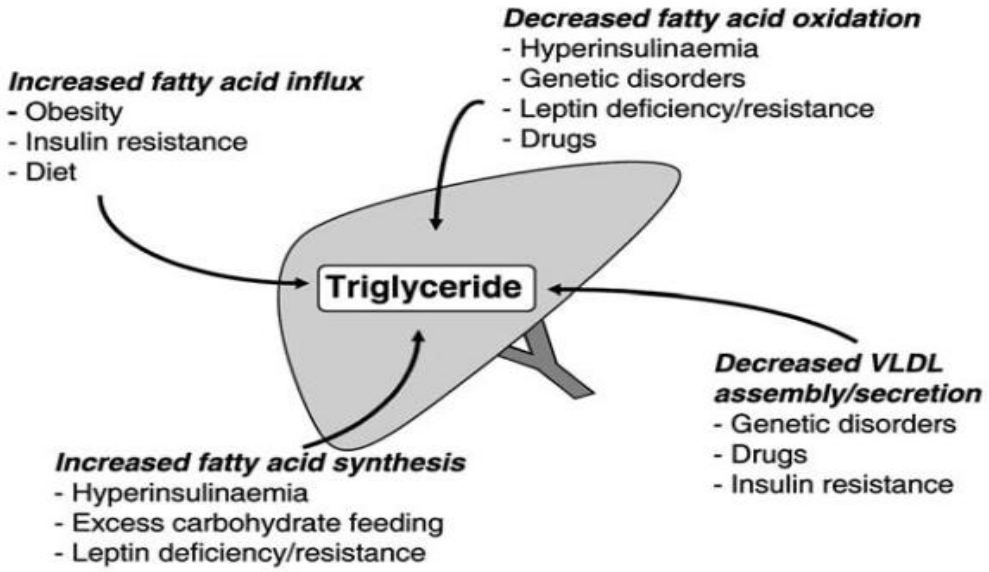
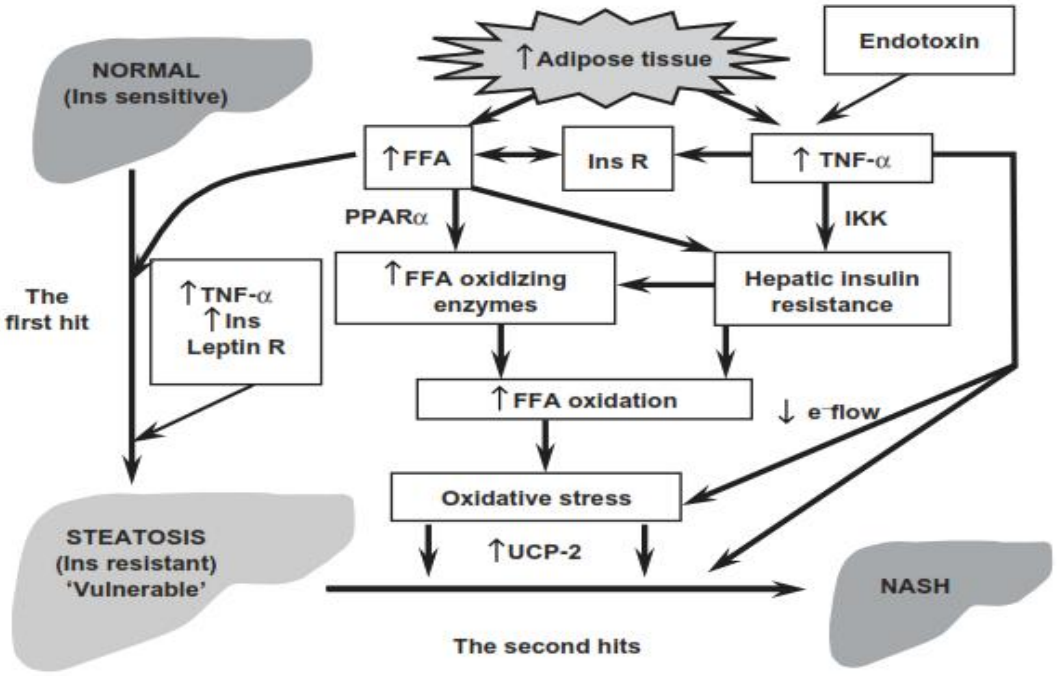


Figure shows Factors involved in triglyceride accumulation in the liver

Day et alin 1998, gave the "two-hit-theory"[36], according to which, first hit leads to hepatic steatosis due to Triglyceride accumulation in the hepatocytes, which results from abnormal balance between formation, supply, consumption and hepatic disposal or oxidation of Triglycerides. Consumption means mitochondrial ß-oxidation of FFA, ketone bodies production and secretion of Triglycerides as VLDL particles When two succeeding wallops delivered to the liver NASH occurs.



NASH related Fibrogenesis:

Hepatic stellate cells (HSC) are quiescent, vitamin A storing cells have the ability to remodel during activation.HSC are activated during liver injury and resolution. When the liver is injured, HSC activation takes place, characterized by change from quiescent to migrating ,proliferative, contractile and extracellular matrix (ECM) producing cells. Fibrosis in NAFLD is a characteristic chicken-wire pericellular distribution.[37]

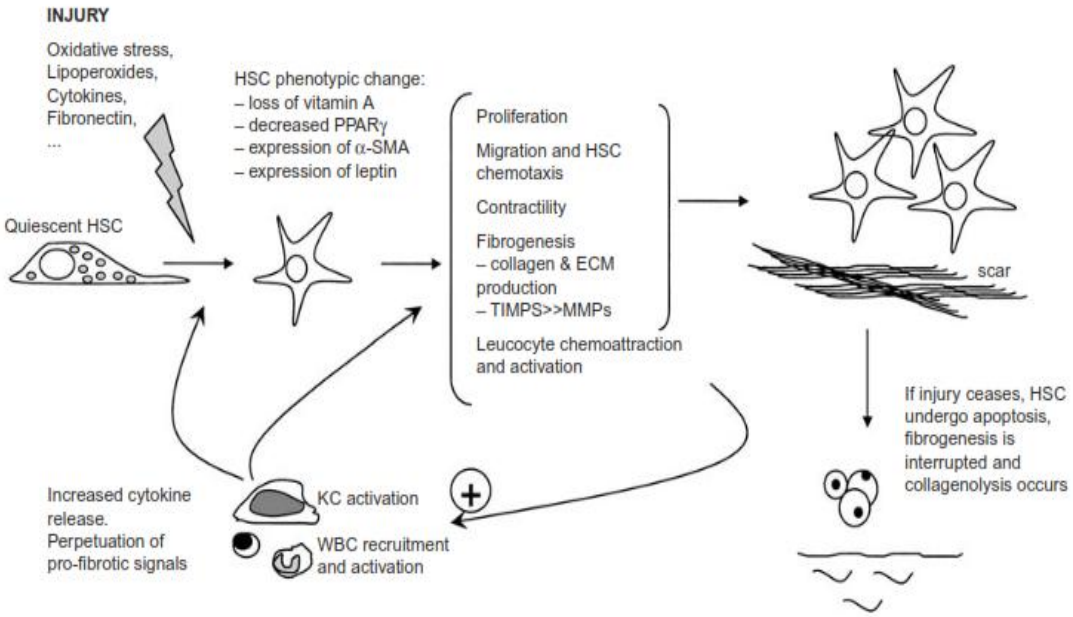
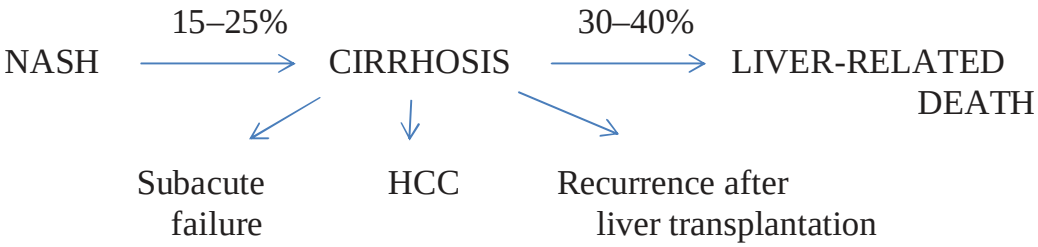


Figure shows the mechanism of fibrogenesis in NASH

NATURAL HISTORY AND PROGNOSIS:

Less than 1% of patients with simple steatosis progressed to cirrhosis or died from liver-related complication after a mean follow-up of 15 years in a pooled analysis of several reported series. NASH with increased fibrosis, had worst prognosis when compared with normal population.[46]

The prevalence of cirrhosis and death related to liver complications is about 11% and 7%, respectively, in patients with NASH during the first 15 years of follow-up. Fbrosis, may remain stable for many years or actually improve or progresses over time in some cases [20]



[20]

Table 34.4 Studies on long-term prognosis of nonalcoholic fatty liver disease (NAFLD)

Author (year)	Diagnosis[a]	*n*	Cirrhosis prevalence (%)[b]	No. of liver-related deaths (%)	No. of deaths overall (%)	Average follow-up (years)
Teli (1995)	Bland steatosis	40	0	0	14 (35)	9.6
Dam-Larsen (2004)	Bland steatosis	109	1	1 (0.9)	27 (24.8)	16.7
Matteoni (1999)	NAFLD	98	20	9 (9)	48 (49)	8.3
Adams (2005)	NAFLD	420	5	7 (1.7)	53 (12.6)	7.6
Ekstedt (2006)	NAFLD	129	7.8	2 (1.6)	26 (20.2)	13.7
Lee (1989)	NASH	39	16.3	1 (3)	10 (26)	3.8
Powell (1990)	NASH	42	7	1 (2)	2 (5)	4.5
Evans (2002)	NASH	26	4	0	4 (15)	8.7
Hui (2004)	Cirrhotic-stage NASH	23	100	5 (21)	6 (26)	5.0
Hashimoto (2005)	NASH with septal fibrosis or cirrhosis	89	48	6 (6.7)	8 (9)	3.7
Sanyal (2006)	Cirrhotic-stage NASH	152	100	22 (14.5)	29 (19.1)	10

[a]NAFLD denotes the inclusion of both patients with simple steatosis and patients with nonalcoholic steatohepatitis (NASH).
[b]Cirrhosis prevalence includes all patients diagnosed with cirrhosis at both baseline and during follow-up.

Matteoni *et al.* [38]divided NAFLD into 4 types :

Category	Pathology	Clinicopathological correlation
Type 1	Simple steatosis	Known to be non-progressive
Type 2	Steatosis plus lobular inflammation	Probably benign (not regarded as NASH)
Type 3	Steatosis, lobular inflammation and ballooning degeneration	NASH without fibrosis—may progress to cirrhosis
Type 4	Steatosis, ballooning degeneration and Mallory bodies, and/or fibrosis	NASH with fibrosis—may progress to cirrhosis and liver failure

Figure below depicts Outcome of NAFLD based on Matteoni et al types, proposed at the consensus conference in 1998.[38]

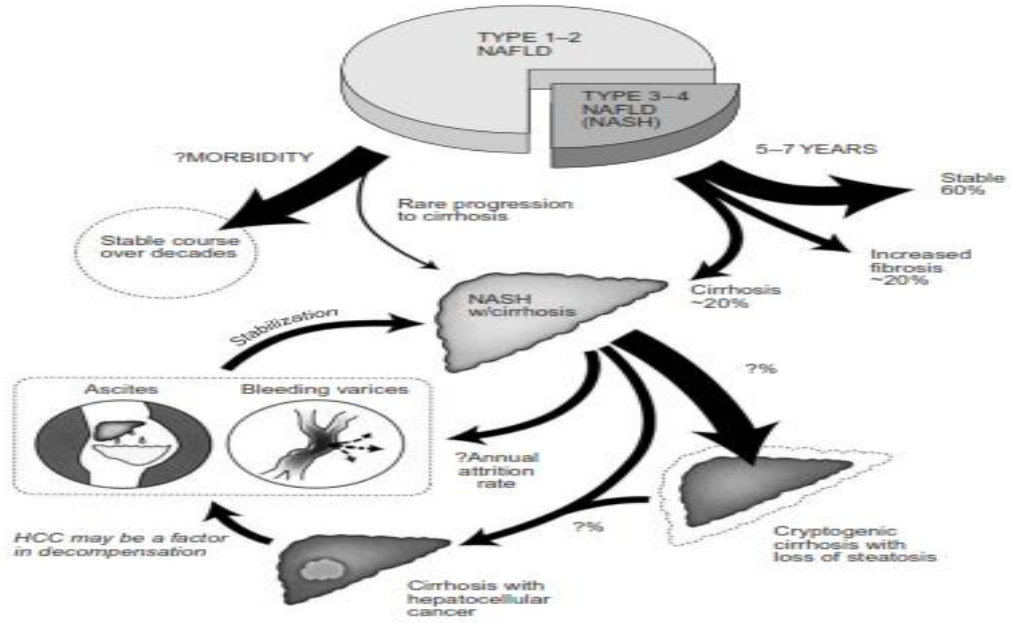
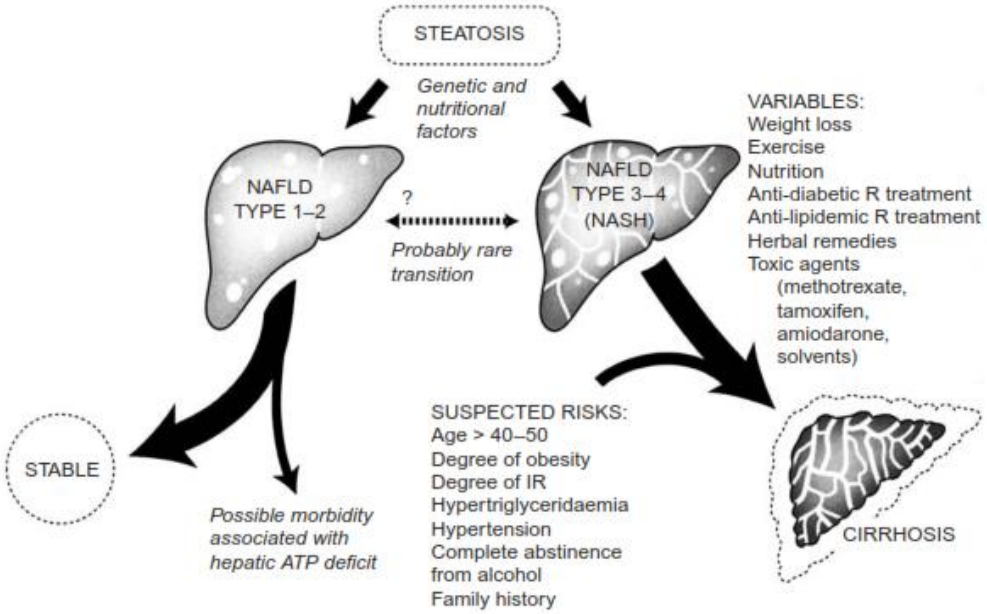


Figure below depicts the Factors involved in NAFLD development and progression [39]



CLINICAL MANIFESTATIONS AND DIAGNOSIS OF NAFLD:

Clinical presentations of NAFLD patients can be any of the following[40].

Metabolic syndrome, .Abnormal liver function tests, Ultrasound imaging of fatty liver, Fatigue, abdominal discomfort, Liver failure, portal hypertension or liver cancer.

Reid et al noted an absence of specific symptoms in 48% to 100% of patients.[41] Sanyal et al noted fatigue in 45 of 62 patients(73%) and right upper quadrant pain in 30 of 62(48%).[42]Moderate hepatomegaly with right upper-quadrant tenderness may be present even up to 50% of cases, but physical examination is generally unremarkable[1].

It is important to rule out the other possible causes of steatosis other than NAFLD[1] like 1.Nutritional-Starvation,Malnutrition,Total parenteral nutrition (TPN) 2.Infection-Hepatitis chronic C3.Systemic disorders-Autoimmune hepatitis, Celiacdisease, IBD4.Medication/toxin-Glucocorticoids,Amiodarone,Methotrexate,Valproic acid, Vitamin A, Ethanol. 5.Inherited metabolic disorders-Wilson disease,a1pha 1-antitrypsindeficiency,Cysticfibrosis,Glycogen storage disease.

Biochemical abnormalities:

Elevations in AST and ALT is common but usually not more than 4 times the upper normal limit.AST/ALT ratio may be variable, usually ALT predominates.[43,44] AST/ALT ratio >2 indicates alcoholic liver disease but also occurs in advanced NAFLD. Isolated elevations in SAP can also be seen.[45]

NON INVASIVE ANALYSIS OF NAFLD:

Several authors[47] proposed different noninvasive tools for differentiating simple steatosis and NASH. NAFLD Fibrosis Score ,AST to Platelet Ratio Index (APRI), BARD score , and FIB-4 are among the more widely investigated noninvasive tools to cross-sectionally predict advanced NAFLD. All are based on clinical and laboratory variables and each of them exhibited varying degrees of accuracy.[53]

Pelekar et al.[48]used adiponectin,8-epi-PGF2α,hyaluronic acid, TGF-β, and predicted NASH with 73.7%sensitivity,65.7%specificity, 68.2% positive predictive value and 68.2% negative predictive value.

Poynard et al.[49] in the Steato Test, used biochemical markers such as total bilirubin, ALT, GGT,haptoglobin,α2-macroglobulin,cholesterol, apolipoprotein A-I, triglycerides, BMI, glucose, age and gender, that

predicted steatosis in >30% with 90% sensitivity and specificity, 93%NPV, 63% PPV.

Fibro Test[50] uses apolipoprotein A-I ,α2-macroglobulin (A2 M), haptoglobin, total bilirubin, GGT, ALT and shows strong PPV (73%) and NPV (90%) for severe fibrosis, but can not differentiate fibrosis stages.

Hepascore uses Age, sex, bilirubin, GGT, hyaluronic acid, α2-macroglobulin.[51]

Harrison et al. [52] used three variables in **BARD score** (BMI ≥28 kg/m2, AST/ALT ratio ≥0.8, and T2DM)in 827 patients with NAFLD and showed96% NPV and odds ratio of 17 to predict advanced fibrosis.

Of all scoring systems ,NAFLD-FS[53] received the most extensive validation and recommended for clinical use in the recent US multi society practice guideline on the diagnosis and management of NAFLD.

NAFLD FIBROSIS SCORE:

Angulo *et al.* ***[46]*** formed a simple non-invasive scoring system using clinical and laboratory variables to find whether advanced fibrosis is present or not in NAFLD patients. This score consists of Age, hyperglycaemia, BMI, platelet count, AST/ALT ratio and albumin. It has a strong PPV(82%) and NPV(93%) for advanced NAFLD fibrosis .

The NAFLD fibrosis score was calculated according to the following formula:

$$-1.675 + 0.037 \times \text{age (years)} + 0.094 \times \text{BMI (kg/m}^2\text{)} + 1.13 \times \text{IFG/diabetes (yes = 1, no = 0)} + 0.99 \times \text{AST/A LT ratio} - 0.013 \times \text{platelet (}\times 109/\text{L)} - 0.66 \times \text{albumin (g/dL)}.$$

When the calculated score is ≤1.455=less probability of fibrosis:

-1.455to 0.675=indeterminate:>0.675=high probability of fibrosis.[4]

In meta-analysis, this NAFLD Score was found to have an AUROC of 0.85 in predicting advanced fibrosis .A score of <1.455 had 90% and 60% sensitivity and specificity respectively to rule out advanced fibrosis. A score > 0.676 had 67% and 97% sensitivity and specificity respectively to predict the advanced fibrosis. The accuracy of the NAFLD-FS in separating patients' risk for long-term outcomes can be explained by the variables included in the scores[46].

Low albumin level = indirect measurement of hepatic syn-thetic reserve

Low platelet count = more advanced liver disease and portal hypertension.[55]

AST and ALT = good indicators of more advanced fibrosis and cirrhosis.

Having low values of albumin and platelets and high AST/ALT ratio or AST/platelet ratio will increase the scores, allowing the identification of patients with a higher risk for liver-related complications and liver-related death or need for liver transplantation. Other variables included in the scores, such as diabetes or hyperglycemia, older age, and greater BMI are high risk factors for mortality from cardiovascular disease and malignancy.

Stuart McPherson et al[47]found all scores can exclude advanced fibrosis but the specificity of the NAFLD fibrosis scores, BARD score and AST/ALT ratio was reduced if patients ALT levels are normal (51%, 26% and 44% respectively) versus elevated ALT levels.

In order to reduce the number of patients undergoing liver biopsy and for staging the disease, it is necessary to develop an algorithm for investigating NAFLD patients. These non invasive tests can be used as first-line to rule out advanced fibrosis and more expensive tests as second-line to diagnose advanced stage in patients with a high NAFLD fibrosis score.

LIVER BIOPSY:

NAFLD is usually confirmed by combining history, laboratory parameters and abdominal imaging. Liver biopsy is the best diagnostic method to confirm and prognosticate NAFLD. Because of invasive procedure it is impractical for widespread use.

NAFLD is characterized histologically with mixed micro and macrovesicular steatosis, Mallory bodies, lobular inflammation, ballooning degeneration, with or without perisinusoidal/perivenular fibrosis. The pattern of fibrosis is characteristically chicken wire fencing common to both Alcoholic and NAFLD hence distinguish from other forms of liver disease.

Characteristic Findings of NAFLD in Liver-Biopsy.

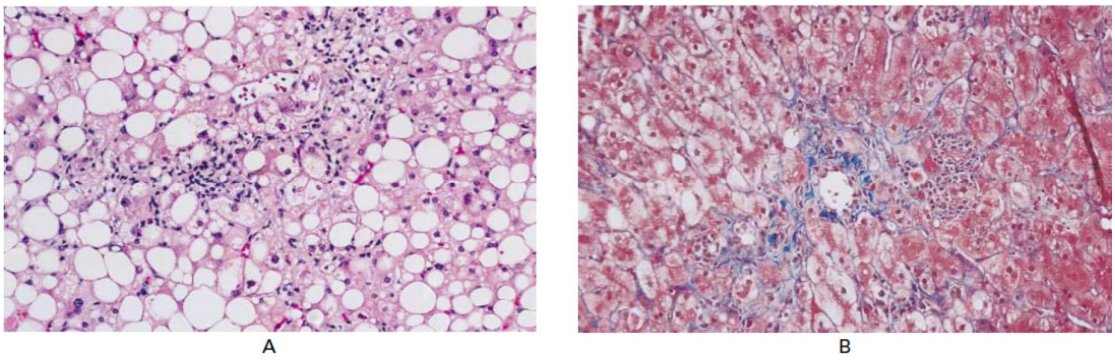


Figure A:macrovesicularsteatosiswith inflammatory infiltrate, hepatocyte ballooning and Mallory's hyaline.

Figure B: Masson's trichrome staining showing perivenular, pericellular and perisinusoidal fibrosis in zone 3 "chicken wire" fibrosis.

Grading of steatosis: (After Brunt)[78]

Grade 1	Fat droplets in < 33% hepatocytes
Grade 2	Fat droplets in 33–66% hepatocytes
Grade 3	Fat droplets in > 66% hepatocytes

Grading of necroinflammation.: (After Brunt)[78]

Grade	Ballooning	Lobular inflammation	Portal inflammation
Grade 1 Mild	Occasional, zone 3 hepatocytes	Polymorphs and mononuclear cells, mild and scattered	None or mild
Grade 2 Moderate	Obvious, present in zone 3	Polymorphs associated with ballooned hepatocytes, +/– mild mononuclear cells	None, mild or moderate
Grade 3 Severe	Marked, predominantly zone 3	Polymorphs concentrated in areas of ballooning Inflammation more than in grade 2	Mild or moderate, *not* marked

Staging of fibrosis:

Stage 1	Zone 3 pericellular fibrosis (focal or extensive)
Stage 2	Zone 3 pericellular fibrosis (focal or extensive) plus portal fibrosis (focal or extensive)
Stage 3	Bridging fibrosis (focal or extensive)
Stage 4	Cirrhosis, +/– foci of residual pericellular fibrosis

IMAGING

Ultrasound

Ultrasound is the least expensive and easily available modality for imaging liver. Its accuracy for identifying steatosis decreases when the liver fat content is < 30%. The steatosis in ultrasound is shown as an increased echo texture, or a ‘‘bright’’ liver. In **Saadeh et al**. study the

ultrasound and computed tomography scan showed 100% and 93%%, sensitivity with 62% and 76% PPV and NPV respectively.[56]

In one study among the 187 obese patients who underwent bariatric surgery, steatosis was diagnosed by ultrasound with 49.1% and 75% sensitivity and specificity.[57]

Palmentieri et al.[58] in his study conducted among 235 patients who underwent ultrasound with liver biopsy found ‘‘bright liver’’ pattern on ultrasonography with91%, 93%, 89%, and 94%,sensitivity, specificity, PPV and NPV respectively, to diagnose >30%steatosis. Hepato-renal contrast (discrepancy in the echogenesity between liver and renal parenchyma) was more precise in differentiating steatosis from fibrosis.[59]If the liver parenchyma is not infiltrated with fat, its echotexture is as same as renal parenchyma, but when fat infiltration is present it becomes ‘‘brighter’.[60] .

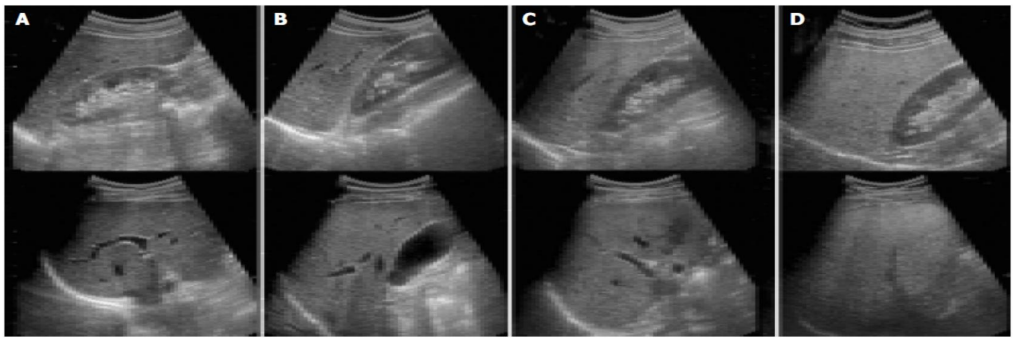


FIGURE: ULTRASOUND GRADING OF LIVER STEATOSIS :[63]
A :NORMAL, B: Grade 1(mild),C:Grade 2(moderate), D:Grade 3(severe)

In 93 chronic liver disease patients who had undergone liver biopsy **Webb et al.**[61] found that the hepatorenal index can grade the steatosis severity to5% lower limit.

Iijima et al.[62] used an contrast agent in ultrasound (Levovist - Sherling, Berlin) to identify NASH. Galactose and palmitic acid in Levovist will be taken up by normal hepatocytes because they participate in metabolism of sugar and fat. If reduced uptake then NASH is diagnosed.

Doppler perfusion index (DPI)is a ratio of arterial blood flow to total blood flow in liver. When steatosis is present the liver hemodynamics are altered[64].NAFLD was found to have valtered DPI in many series.[65,66,67]

Computerised tomography:

Piekarski et al in his study[68] measured in normal subjects the non contrast CT numbers. Lower CT numbers are found in fatty livers. **Park et al**. [69] identified steatosis in 154 patients who have undergone liver biopsy using non enhanced CT. They used liver-to-spleen attenuation ratio and difference for identifying >30%steatosis and showed100%specificity 73% to 82% sensitivity. **Osawa and Mori**[60] detected steatosis using hepato-renal difference in CT scan with 91.3% , 83.8% , 86.7% -sensitivity, specificity and accuracy.

Figure showing CT SCAN image of fatty liver with low attenuation of liver when compared to spleen

Lee et al.[70] used both nonenhanced CT scans and liver-to-spleen attenuation and proved both of them have equal efficacy in diagnosing >30% steatosis. Non contrast is better than contrast-enhanced CT scan for identifying hepatic steatosis. [71]

Magnetic resonance imaging(MRI):

Fatty changes in MRI is assessed from chemical shifts difference in between fat and water. **Fishbein et al**. [72]correlated histology, ultrasound, and MRI in NAFLD patients and showed MRI was able to accurately detect 3%. Steatosis.

MRS[73] Proton magnetic resonance spectroscopy is a MRI variant, found to accurately measure steatosis. **Szczepaniak et al.**[74] utilised proton MRS in 375 subjects and measured hepatic triglyceride levels (HTGC) and found 34.3% had HTGC>5%, diagnostic level for hepatic steatosis. Browning et al.[75] by using this found37.6% steatosis in his population.

Magnetic resonance elastography (MRE): A mechanical wave is generated and MRI scans are used to measure the displacement in the liver, which are converted to a elasticity measure.[76]**Yin et al**. [77] used MRE and showed in 85 patients this scan was able separatestage 0–1 fibrosis from stage 2–4 fibrosis with 86% sensitivity and85% specificity. MRI and MRS detects subtle fat changes more accurately than CT or ultrasound but limited due to high cost and less accessible.

Overview and developments in noninvasive diagnosis of nonalcoholic fatty liver disease

Routine laboratory tests Liver enzymes Parameters of liver dysfunction **Imaging methods** Ultrasound Computed tomography Magnetic resonance imaging Magnetic resonance elastography **Liver stiffness measurement** Transient elastography (FibroScan) Acoustic radiation force impulse imaging **Multicomponent tests for diagnosis of non-alcoholic steatohepatitis** Nash test Non-alcoholic steatohepatitis clinical scoring system for morbid obesity	**Biomarkers of necroinflammation** Cytokeratin 18 fragments High-sensitivity C-reactive Protein , Interleukin-6, C-C chemokine ligand 2 Plasma pentraxin 3, Oxidative stress measurement, Tumor necrosis factor-a Adiponectin, Insulin resistance measurement. **Multicomponent panels for diagnosis of fibrosis** Fibrotest**,** Non-alcoholic fatty liver disease fibrosis score, European liver fibrosis panel/enhanced liver fibrosis panel. **Biomarkers of fibrosis** Hyaluronic acid, Laminin TypeVIcollagen 7S domain

LIVER STIFFNESS (LS) MEASUREMENT :

Liver stiffness(LS) is named as Young's modulus or the modulus of elasticity[79]based on the principles of **Hooke's law of elasticity,** expressed in kilopascals (kPa) and shows the resistance of the liver to deformation.LS, depends on many factors-1.extracellular matrix, 2.constraints or pressure applied,3internal pressure inside the liver, 3.viscous effects.

TRANSIENT ELASTOGRAPHY (FIBROSCAN):

Fibroscan is a non-invasive ultrasound technique[80which is painless, and quick (5–10 min) method for measuring liver stiffness, which is positively correlated with the fibrosis degree .[81,82,83]

Basic principles:

TE is based on the principle of Hooke's law(strain response of the material to external stress) . A transducer probe (ultrasound) is mounted on the vibrator axis which delivers vibrations of low frequency (50 Hz)and low amplitude . The transducer transmits the vibrations from a right intercostal space. Elastic shear wave are produced propagates through the liver and the speed of propagation is measured using Pulse-echo ultrasound. This speed is proportional to the stiffness of the tissue, with faster wave progression occurring through stiffer material.[85].

Fibroscan measures LS as a cylindrical volume in 1cm wide and 4cm long, between 2.5 and 6.5 cm beneath the skin surface with the standard M-probe, and between 3.5 and 7.5 cm for the recently developed XL probe, recommended for obese patients[86,87]. It is at least 100 times larger than a liver biopsy sample and results, are more representative of the hepatic parenchyma.

TE does not work for the left liver lobe or from a subcostal approach and the measurement is only feasible via a few intercostal spaces. Therefore, the technique is limited. Inter- and intra-observer variability depend on the intercostal space used, the presence of ascites, musculoskeletal habitus, depth of subcutaneous tissue, position of the patient, and many other factors[88].

Performing the Technique:[84]

The measurements with FibroScan are taken via an intercostal space from the right lobe of liver. Patient lies supine and the right arm kept behind the head. The probe tip is covered with coupling gel and placed over the skin in between the ribs at the right lobe level. Once the area is located, the operator presses the shot button to start acquisition. The machine will not give reading for an unsuccessfull shot. LS is expressed in kilopascals (kPa) in a range from 2.5 and 75 kPa.

Figure A:Fibroscan monitor, B:Measurement in Normal liver, C:Cirrhosis

Advantages:

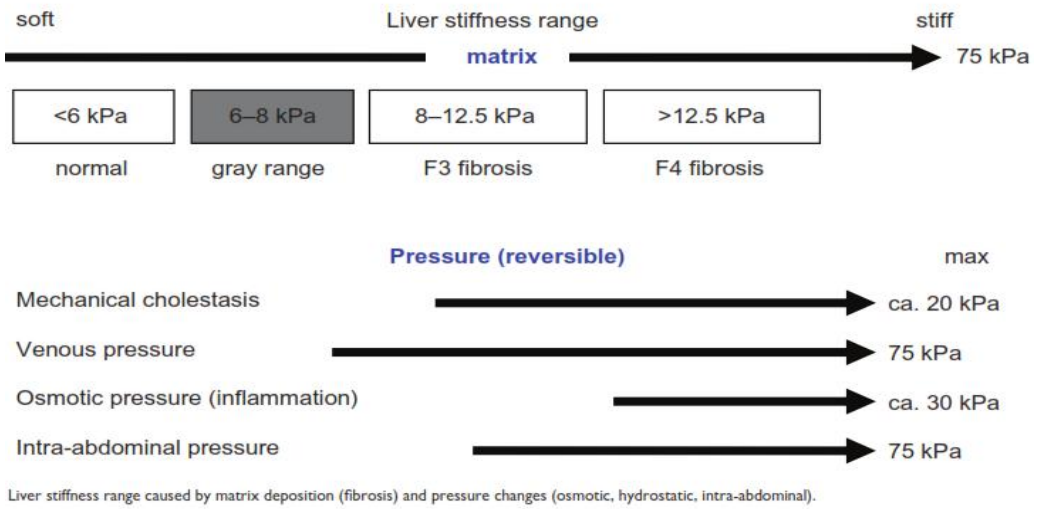
Rapid procedure (less than 5 min), painless, results are immediately available. Easy to perform in outpatient clinic or at the bedside within a short learning period (100 examinations). Excellent inter- and intra-observer agreement, which makes it suitable for widespread application in clinical practice.

Liver Stiffness Evaluation (LSE) Criteria:[80]

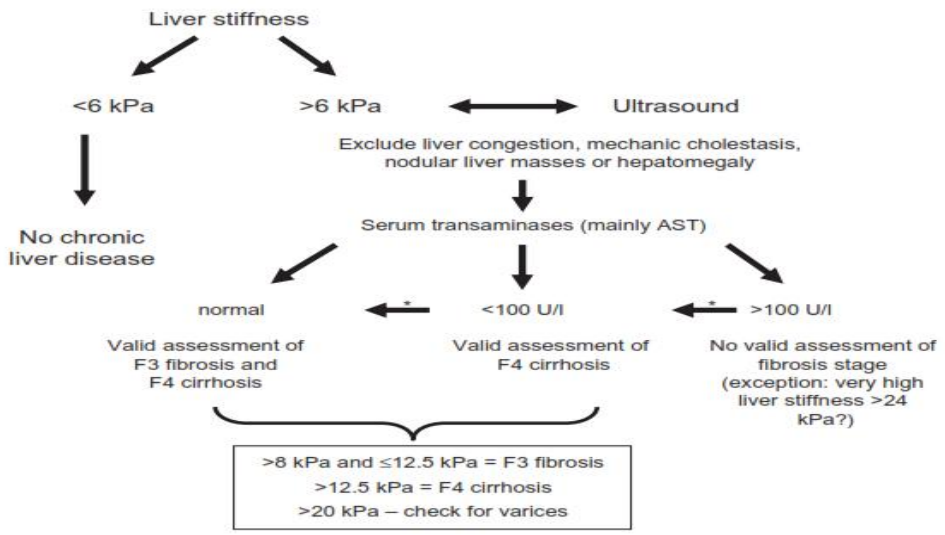
LSE is the median of the 10successful stiffness values measured. LSE ranges from lowest stiffness 2.5 kPa to highest stiffness 75 kPa. LSE failure is termed, if with even 10 attempts no measurements are obtained. Success rate is calculated as the number of successful measurements divided by total numbers attempted (expressed in %). LSE is valid only if all three, ≥10 measurements are successful ,≥60% success rate , IQR/median ratio <0.30 are achieved.

The validity depends on 2 parameters, the success rate and the interquartile range (IQR). Both feasibility and reproducibility of the TE measurement may be affected by high body mass index (BMI). failure rate of 3.1% was reported and Unreliable results were reported in 15.8% of measurements and were associated with a BMI > 30 kg/m, age> 52 years, female sex, operator experience and type 2 Diabetes.

LS measurement outscores all noninvasive methods in identifying advanced fibrosis and cirrhosis. LS < 6 kPa is normal and excludes ongoing liver disease. LS between 8 and 12.5 kPa is the cut-off values to detect F3 and F4 fibrosis.LS >20 kPa highly correlates with development of portal pressure, and Esophageal varices.LS is also increased by tumor cells, amyloidosis, mast cells and inflammatory cells, cholestasis, liver congeston.



Liver stiffness range caused by matrix deposition (fibrosis) and pressure changes (osmotic, hydrostatic, intra-abdominal).



In biopsy-proven 27NAFLD patients ,**Takeda et al** [89]compared Fibro-Scan liver stiffness values with Brunt fibrosis score and found LS was much higher with stage 3 or 4 fibrosis patients than with lower stages.

In 135 biopsy-proven NASH patients, **Fukuzawa et al.**[90] measured LS and found liver elasticity can accurately predict fibrosis and distinguish patients within each of the Brunt fibrosis stages (F0-1, F2, F3 and F4).

OTHER TECHNIQES FOR LIVER STIFFNESS MEASUREMENTS:[80]

- **ACOUSTIC RADIATION FORCE IMPULSEIMAGING(ARFI):**

Acoustic pulses of Short-duration and 2.67 MHz fixed transmit frequency, are generated in the ROI (Region Of Interest).This causes mechanical excitation in the tissues and shear waves are formed due to tissue displacement and propagate away from the region of excitation.

Ultrasound tracking beams laterally adjacent to the single push beam are used to estimate the shear wave speed in the tissue by measuring the time to peak displacement with each lateral location.[91]

The accuracy of ARFI and TE has been shown to be similar in the differentiation of normal liver parenchyma from liver cirrhosis. ARFI has a significant advantage over TE in that it simultaneously displays a conventional ultrasound image. ARFI allows different measurement sites, comparison of measurements in the right and left liver lobes have been made, results in the right lobe revealed higher diagnostic accuracy compared to the left[92]. ARFI has also been evaluated in patients with NAFLD and NASH[93,94] and in patients after liver transplantation.

- **2D SWE(2D-SHEAR WAVE ELASTICITY):**

2D SWE is formed by the combination of radiation force produced in the tissues by focused ultrasonic beams with very high frame rate (5000 f/s) ultrasound imaging able to catch ,the resulting transient shear waves propagation [95,96]in real time.

Comparison of various techniques to assess liver stiffness[79]

	Method	Product name	Vibration mode/source	Frequency	Advantages	Limitations
Static elastography	Quasi-static compression	eg, by Hitachi	None	Not applicable	Widely available in ultrasound scanners	Qualitative only
Magnetic resonance elastography	Shear wave	Optima MR450 w 1.5 T	Continuous mechanical actuator	50–60 Hz	2D/3D stiffness mapping, frequency controlled vibration, other organs	Expensive, metal implants (pace makers, bone implants)
Acoustic radiation force impulse	Shear wave	Acuson S2000	Transient radiation force		Ascites, other organs	Accuracy, limited clinical data
Vibration-controlled transient elastography	Shear wave	FibroScan®	Transient mechanical actuator	50 Hz	Largely validated, frequency controlled vibration	Sensitive to body habitus (obesity, ascites, bowel interpolate)

Liver stiffness (LS) is a surrogate marker for fibrosis stage:[79]

LS correlates accurately with fibrosis stage ($r > 0.7$ and $P < 0.005$). LS can identify F3fibrosis andF4cirrhosis with high accuracy (AUROC >0.9) whereas F1 and F2 Fibrosis stages only mildly increase the LS.

Despite some variability, cut-off values of 8.0 and 12.5 kPa are widely accepted to identify patients with F3 and F4 fibrosis, respectively.

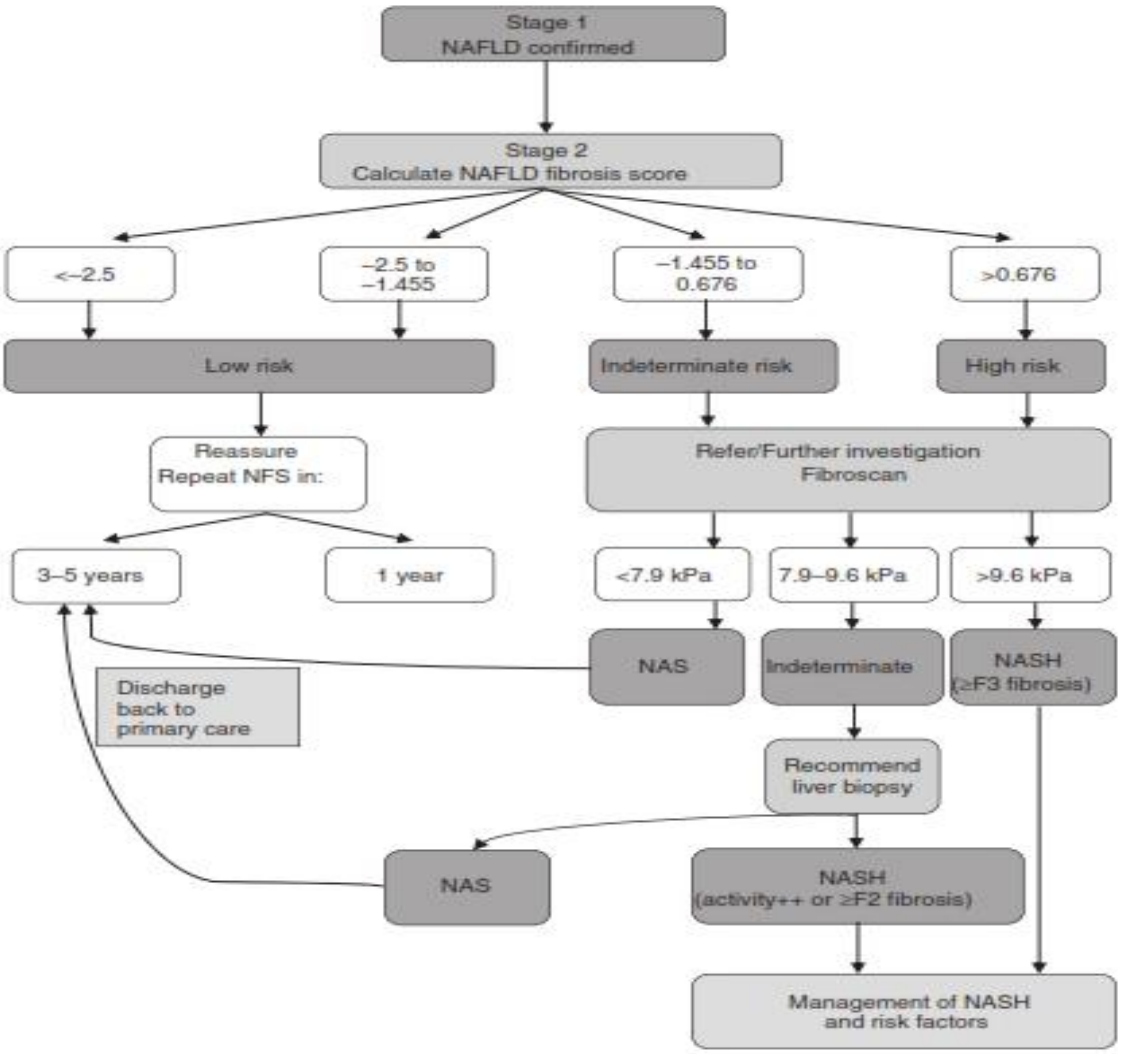
ALGORITHM FOR NON INVASIVE DIAGNOSIS AND STAGING IN NAFLD: [6]

An algorithm is proposed for non invasive diagnosis and management of NAFLD patients in a recent published article by **Dowman et al**[6].

In that article, if fatty liver is identified by USG then using the clinical and laboratory data the NAFLD fibrosis score is calculated. If the score is below the lower cut-off level then these patients are at low risk of significant fibrosis and are managed safely in primary care.

If the score is indeterminate or high they should be referred for specialist care. They are further subjected to further investigations such a fibroscan or serum markers panel to identify the risk of fibrosis and

staging. Liver biopsy should only be done in those patients where the non-invasive test results are inconclusive.



MATERIALS AND METHODS

Source:

For the study, consecutive T2DM patients attending diabetic outpatient clinic in the Stanley medical college Hospital between April 2013 and March 2014, will be evaluated on the basis of clinical, biochemical, ultrasonographic findings .

Inclusion criteria:

1. All the patients with atleast , one year history of T2DM, were on oral hypoglycaemic agents and/or insulin injections.
2. Age between 25-65 yrs.

Exclusion criteria:

1. An alcohol ingestion >30 grams/day in males ,>20 grams/day in females.
2. History suggesting chronic liver disease with any etiology,
3. History of any severe disease such as malignancy,
4. Intake of drugs known to cause fatty liver disease -steroids, synthetic estrogens, heparin, calcium channel blockers, amiodarone, valproic acid, antiviral agents
5. History of any parenteral nutrition
6. Hereditary disorders and inborn errors of metabolism
7. Starvation
8. Acute fatty liver of pregnancy, HELLP Syndrome

STUDY DESIGN: This is a prospective study conducted in diabetic patients.

All patients fulfilling the inclusion criteria during the study, history, anthropometry and physical examination were done and recorded accordingly, after taking informed consent of the patient. This study was approved by the Institutional Ethical Committee. All patients in the study had undergone routine investigation including complete blood counts, blood sugar, liver function test, HbsAg, Anti HCV, and fasting Lipid Profile.

Abdominal girth measurements were taken midway between umbilicus and lower costal margin and blood pressure measured in sitting posture in both the upper limbs.

Metabolic syndrome was diagnosed as per NCEP ATP 3 criteria[7] - three or more of the following,

1. Waist circumference :Males: >90cms, Females: > 80cms
2. Fasting glucose≥100mg%
3. Hypertension(mm/hg)> 130/85 mmHg
4. High triglycerides (mg/dl) ≥ 150mg/dl
5. Low HDL(mg/dl) : in Males: < 40 mg/dl, in Females: < 50 mg/dl

This also includes patients diagnosed previously with hypertension, high TGL, low HDL, IFG, IGT or T2DM, and those were already on treatment for these disorders.

NAFLD is detected by means of ultrasonography done by single experienced radiologist, using a B-mode ultrasonography ,high-resolution system with an electric linear transducer mid frequency of 3–5 MHz .An increase in hepatic echogenicity is noted .The enhancement and differential loss in the periportal intensity and the vascular wall due to increased hyperechogenicity in the liver parenchyma is also noted. The degree of involvement was standardised with semi quantitative scale for the degree of hepatic involvement.[8]

Grade 1: Diffuse increase in the fine echoes slightly. Liver is bright compared to the cortex of the kidneys are visualised normally.

Grade 2: moderately diffuse increase in fine liver echoes, mild impairment in visualisation of Intrahepatic vascular borders and diaphragm .

Grade 3: markedly increased liver fine echoes, Intrahepatic vessel borders, diaphragm and the vessels not visualised.

NAFLD was suspected if there is abnormal liver biochemistry, bright liver on ultrasound and no known causes identified for the liver disease.

Diagnosed NAFLD patients were subjected to NAFLD fibrosis score calculated according to the following formula using Online calculator(www.nafldscore.com) given by Angulo P, Marchesini G et al.

$$-1.675 + 0.037 \times \text{age (years)} + 0.094 \times \text{BMI (kg/m}^2\text{)} + 1.13 \times \text{IFG/diabetes (yes = 1, no = 0)} + 0.99 \times \text{AST/A LT ratio} - 0.013 \times \text{platelet (}\times 109\text{/L)} - 0.66 \times \text{albumin (g/dL)}.$$

Based on the score, if the value obtained is between -1.455 and 0.676 or >0.676 intermediate risk or high risk patients are identified. Those patients with grade 2 and 3 fatty liver by ultrasound with NAFLD Fibrosis score (indeterminate and high risk) are refered for liver stiffness evaluation with fibroscan.

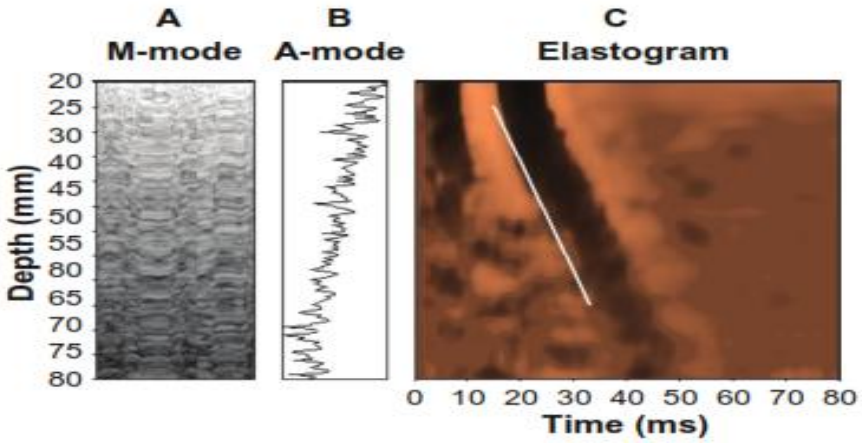
Transient Elastography (Fibroscan -manufacturer: Echosens, Paris, France) done in department of hepatology at Madras medical college, by single experienced personal, as per the manufacturer's recommendations, with the patient in supine position and right arm over the head. Transducer probe (M Probe or XL probe) tip is coated with coupling gel and placed over the skin in between the ribs focussing towards the right lobe of liver. When a suitable target area had been located, several attempts made to collect minimum 10 valid measurements from a depth of 25 mm to 65 mm below the skin surface.

The success rate (SR) , median liver stiffness value (kPa), and ratio of interquartile range (IQR) of liver stiffness to median (IQR/M) were calculated.

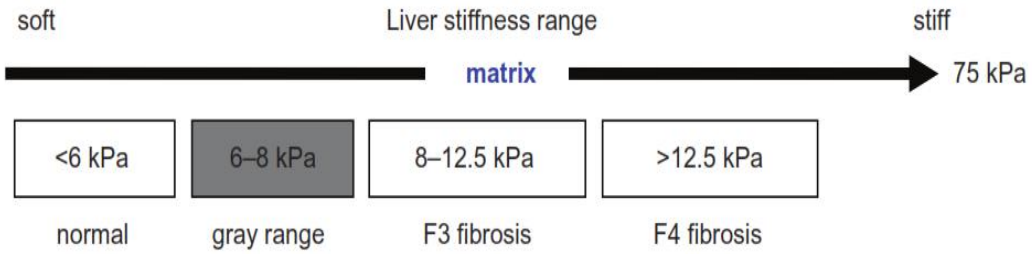
Examinations with < 10 valid measurements, SR of < 60% and/or an IQR/M ≥ 30% were considered to be unreliable.

Fibroscan -manufacturer:Echosens, Paris, France

Liver stiffness measurements are done over the right lobe of liver in intercostal space using **A**) A-mode and **B**) M-mode images to locate the liver. Shear wave velocity is derived from **C**) elastogram (strains induced in the liver due to shear wave propagation as a function of time and depth.



The results of the fibroscan are interpreted as follows



Based on these values a correlation is made between ultrasound grading of fatty liver, NAFLD Fibrosis score and fibroscan liver stiffness to identify patients who merits for invasive liver biopsy to decide on further treatment protocol.

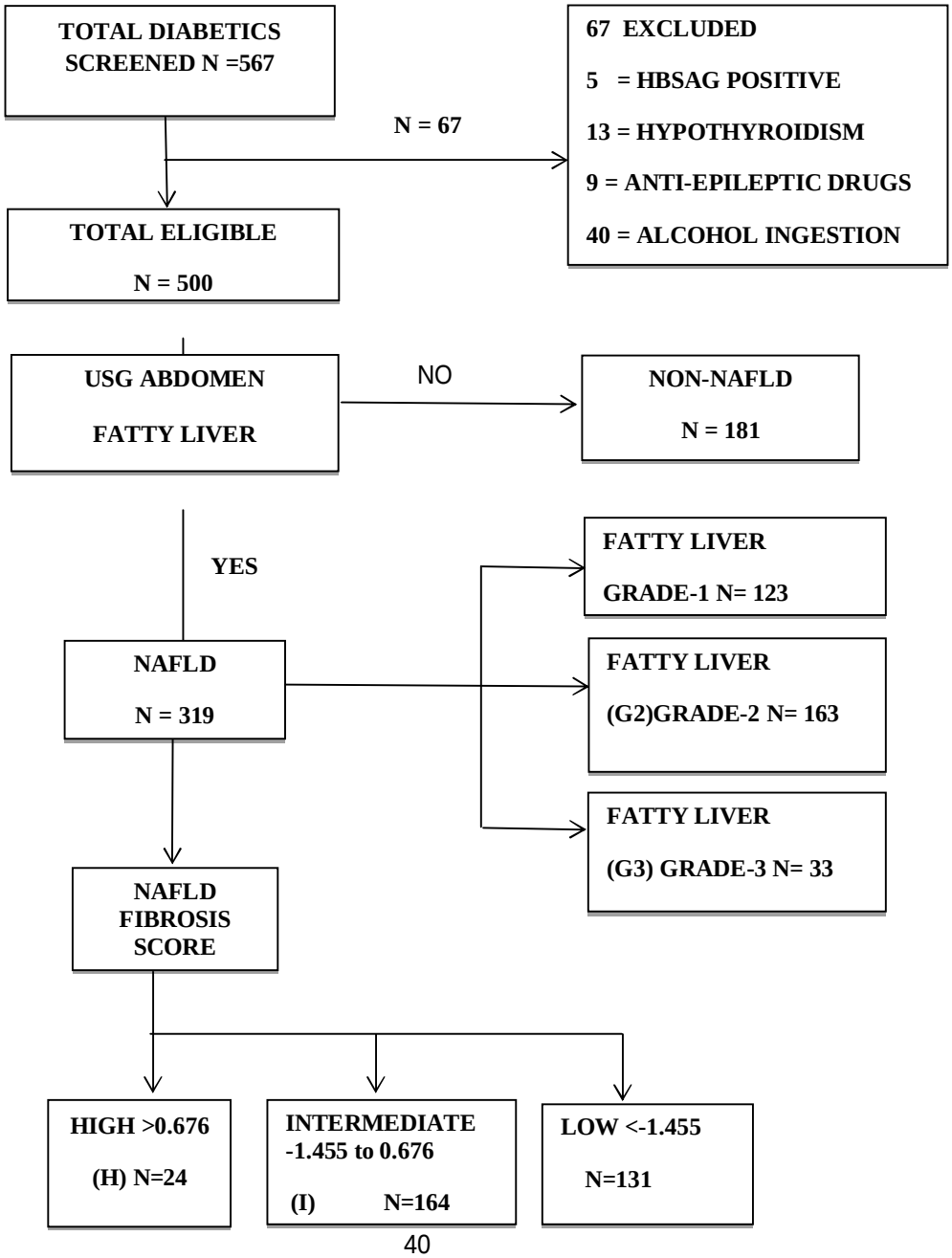
STATISTICAL ANALYSIS

Statistical data analysis was conducted with SPSS, version 17.0 (SPSS, Inc. Chicago, IL, USA). Continuous variables were expressed in mean ± standard deviation (SD). Qualitative data were represented as numbers, with the percent ages indicated within parentheses. The statistical significance of differences in the quantitative data were determined using the one way ANOVA and categorical variables were compared with CHI SQUARE test. P value of < 0.05 was considered a statistically significant difference.

OBSERVATION AND RESULTS

In this study a total of 567 patients were screened out of which 500 patients satisfied the inclusion criteria and were analysed as per the flow diagram.

FLOW DIAGRAM 1:



A total of 184 patients who had grade 2 and 3 fatty liver with intermediate and high NAFLD risk score were selected and subjected to fibroscan estimation of liver stiffness. In 84 patients fibroscan was not done and the results were analysed only for 100 patients as follows.

FLOW DIAGRAM 2:

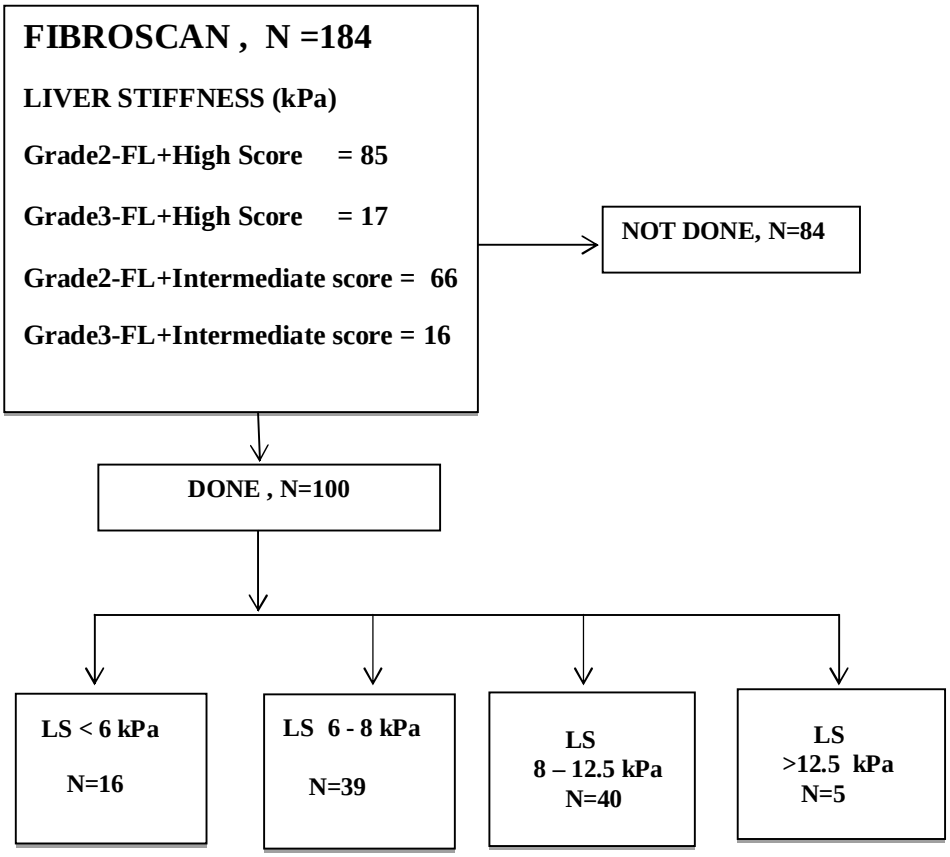


TABLE NO.1

DISTRIBUTION OF GRADES OF FATTY LIVER BASED ON ULTRASOUND

NAFLD BY ULTRASOUND	TOTAL(n=70)	PERCENTAGE (%)
NO FATTY LIVER	181	36.2
GRADE I	123	24.6
GRADE II	163	32.6
GRADE III	33	6.6

Of the total 500 patients 319(63.8%)had fatty liver[NAFLD] and 181(36.2%) had no fatty liver[NON NAFLD].Among the NAFLD patients 38.5%, 51 % and 10.3% had grade I, grade II and grade III fatty liver as diagnosed by ultrasound.

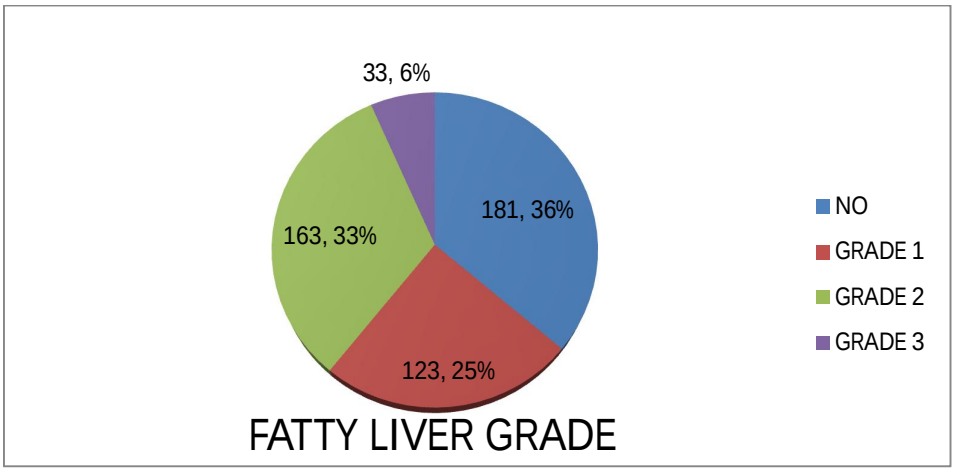


TABLE NO.2

AGE DISTRIBUTION OF NAFLD AND NON NAFLD PATIENTS

Age group (years)	NAFLD(USG)			Total (n=319) %	NON NAFLD Total (n=181)%
	Grade I (n=123)	Grade II (n=163)	Grade III (n=33)		
26-35	5	5	3	13(4.07%)	3(1.6%)
36-45	24	23	5	52(16.3%)	40(22.1%)
46-55	42	57	7	106(33.2%)	74(40.9%)
56-65	41	53	16	110(34.4%)	48(26.5%)
66-75	11	25	2	38(11.9%)	16(8.8%)

In this study the majority of patients are in the age group of 56-65 years and 46-55 years in NAFLD and non NAFLD group respectively.

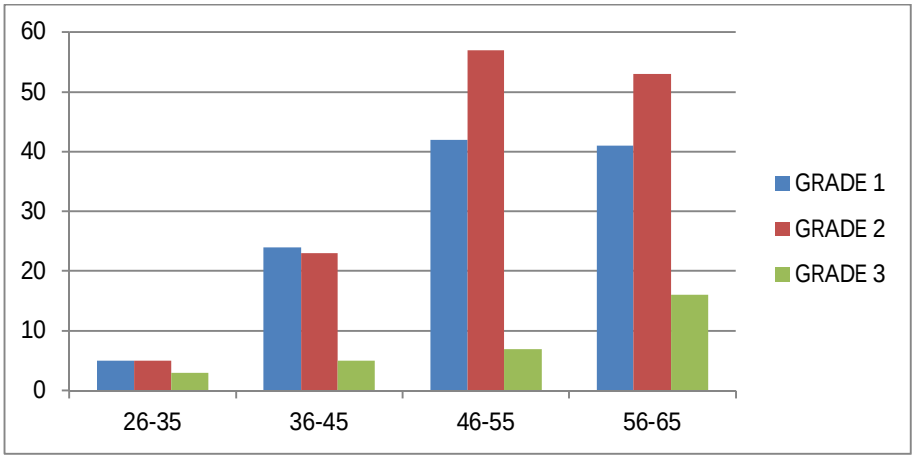


TABLE NO.3

GENDER DISTRIBUTION OF NAFLD AND NON NAFLD PATIENTS

Sex	NAFLD(USG)			Total (n=319)%	NON-NAFLD Total(n=181) %
	Grade I (n=123)	Grade II (n=163)	Grade III (n=33)		
Male	22	25	7	54(16.9%)	37(20.4%)
Female	101	138	26	265(83.1%)	144(79.6%)

In this study majority are females i.e. 265 out of 319(83.1%) in NAFLD group and 144 out of 181(79.6%) in Non NAFLD group.

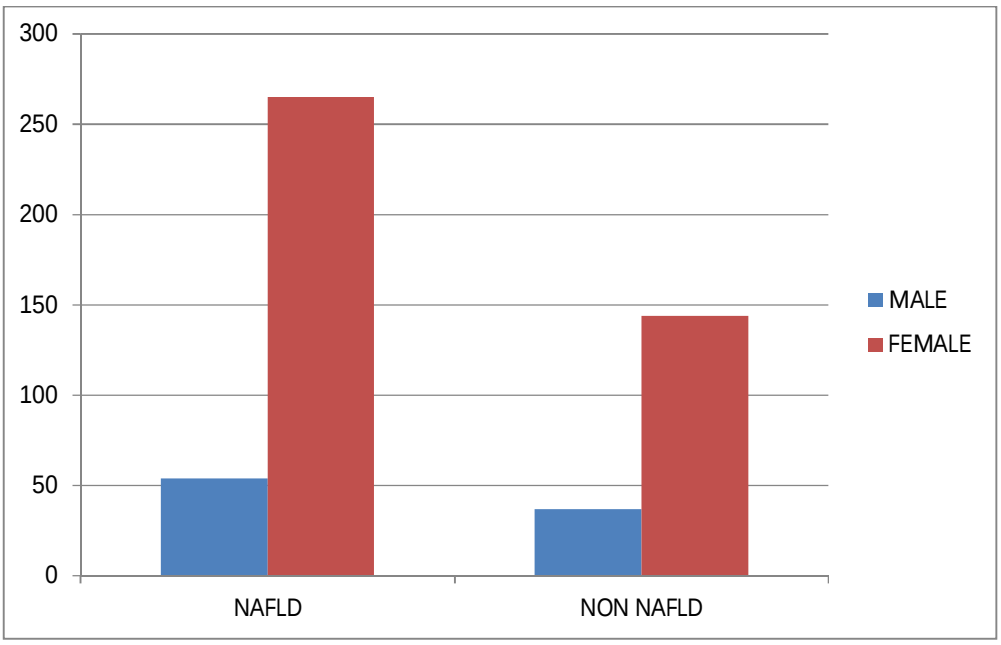


TABLE NO.4

AGE DISTRIBUTION AMONG NAFLD FIBROSIS RISK SCORE

AGE GROUP IN YRS	RISK OF FIBROSIS			TOTAL	Pearson Chi-Square
	LOW	INTERMEDIATE	HIGH		
26-35	3	10	0	13	Value
36-45	3	35	14	52	38.201(a)
46-55	12	56	38	106	df = 8
56-65	6	53	51	110	
66-75	0	10	28	38	P VALUE
TOTAL	24	164	131	319	<0.001

The above table shows most of the patients with intermediate and high NAFLD score were in the age group of 46-65 years. As the age advances, the risk of fibrosis increases with a highly significant P value(0.00).

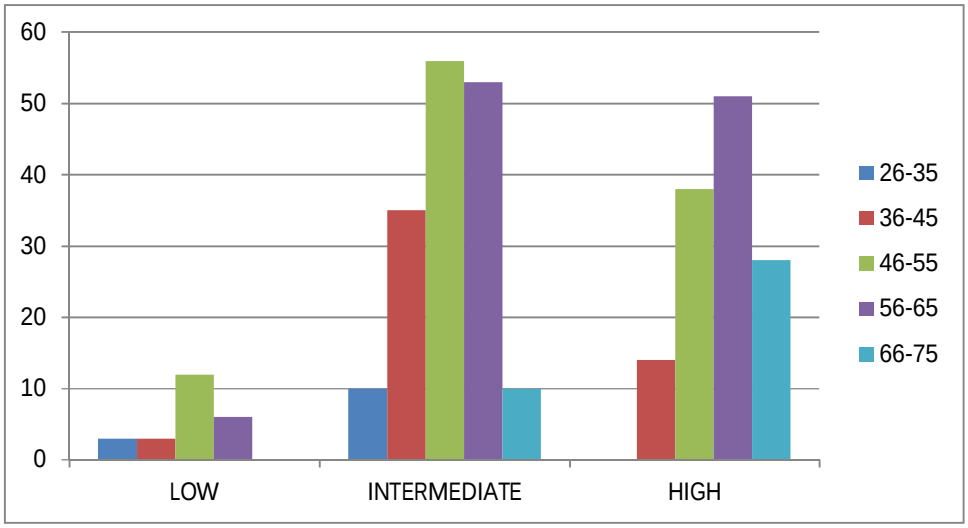


TABLE NO.5

DISTRIBUTION OF METABOLIC SYNDROME AMONG NAFLD AND NON NAFLD PATIENTS

VARIABLES		NAFLD (N=319)%			NON NAFLD (N=181)%
		GRADE I N=123	GRADE II N=163	GRADEIII N=33	
BP>135/85	PRESENT	17	62	18	12
	ABSENT	106	101	15	169
CENTRAL OBESITY	PRESENT	101	156	31	125
	ABSENT	22	7	2	56
LOW HDL	PRESENT	44	84	27	33
	ABSENT	79	79	6	148
HYPERTRIGLYCERIDIMIA	PRESENT	37	156	31	32
	ABSENT	86	7	2	149
METABOLIC SYNDROME	PRESENT	16	156	31	28
	ABSENT	77	7	2	153

From the above table, metabolic syndrome is found in 73% of the NAFLD patients whereas in non NAFLD patients only 15.4%. Among the NAFLD patients Grade 1- 13%, Grade 2- 95.7%, Grade 3- 93.93% had metabolic syndrome

By applying CHI square test P value was <0.001 highly significant.

TABLE NO.6

DISTRIBUTION OF BMI AMONG NAFLD AND NON NAFLD PATIENTS

BMI	NAFLD (N=319)			NON NAFLD (N=181)
	GRADE I (N=123)	GRADE II (N=163)	GRADE III (N=33)	
<18.5	0(0%)	0(0%)	0(0%)	7(3.86%)
18.5-22.9	19(15.4%)	10(6.13%)	0(0%)	59(32.6%)
23-24.9	17(13.8%)	25(15.33%)	4(12.1%)	43(23.7%)
25-29.9	70(56.9%)	66(40.5%)	11(33.3%)	60(33.1%)
>30	17(13.8%)	62(38.03%)	18(54.5%)	12(6.6%)

In NAFLD and non NAFLD cases the mean BMI was 28.04±4.12 $kg/m^2$and 24.44±3.08 kg/m^2.The mean BMI among the NAFLD cases were Mean BMI (kg/m^2)**:**Grade I-26.65±3.4

Grade II-28.51±4.05

Grade III-30.92±4.96

46 out of 319(14.4%) of NAFLD patients were overweight(BMI=23-24.9),147 out of 319 (46.08%) were moderately obese (BMI=25-29.9) and 97 out of 319 (30.4%) patients were severely obese (BMI≥30).There was statistical significance (P<0.001) when comparing the means within the NAFLD cases using ANOVA.

TABLE NO.7

CLINICAL AND BIOCHEMICAL PROFILES OF ALL CASES OF NAFLD AND NON NAFLD

VARIABLES	NAFLD (N=319)			NON NAFLD (N=181)
	GRADE I (N=123)	GRADE II (N=163)	GRADE III (N=33)	
ABDOMINAL PAIN	32	100	18	43
FATIGUE	30	105	15	32
MALAISE	14	54	7	26
HEPATOMEGALY	3	25	22	12
ASYMPTOMATIC	51	64	10	37
AGE	53.74	55.40	54.06	52.65
BMI	26.65	28.51	30.92	24.44
PLATELETS	208.63	199.82	212.12	224.97
AST	32.60	32.51	34.21	30.27
ALT	24.46	23.04	25.18	22.87
ALBUMIN	4.04	3.94	3.66	4.06

By comparing the mean of clinical and laboratory data in the NAFLD patients within different grades of fatty liver and with NON NAFLD patients, variables such as BMI, platelets and serum albumin were found to have significant difference .P value. AST was always higher than ALT in all grades. AST to ALT ratio was >1.

TABLE NO.8

DISTRIBUTION OF NAFLD FIBROSIS RISK SCORE WITH GRADES OF FATTY LIVER

RISK OF FIBROSIS	USG ABDOMEN GRADE (NAFLD)			TOTAL N=319
	GRADE I (N=123)	GRADE II (N=163)	GRADE III (N=33)	
LOW	12(9.7%)	12(7.36%)	0(0%)	24(7.53%)
INTERMEDIATE	82(66.6%)	66(40.5%)	16(48.48%)	164(51.41%)
HIGH	29(23.6%)	85(52.14%)	17(51.51%)	131(41.06%)

The above chart shows most of the NAFLD patients are in the intermediate (164/319 = 51.41%) and high risk(131/319 = 41.06%) for NAFLD fibrosis score. The risk increases as the grade of the fatty liver increases.

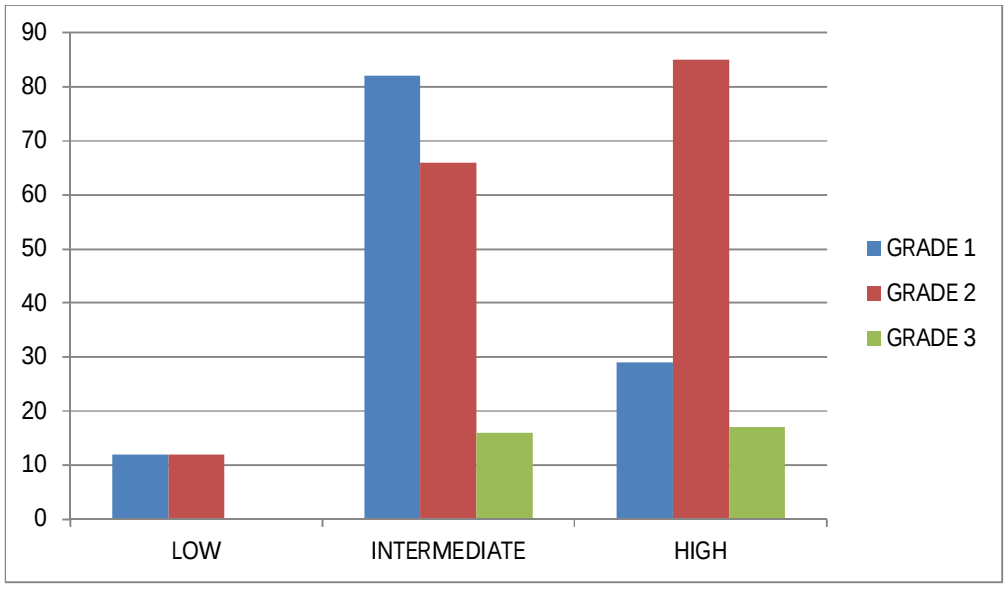


TABLE NO.9

AGE DISTRIBUTION AMONG RISK OF FIBROSIS

Age group (years)	RISK OF FIBROSIS			Total (n=319) %
	LOW (n=24)	INTERMEDIATE (n=164)	HIGH (n=131)	
26-35	3(12.5%)	10(6.1%)	0	13(4.07%)
36-45	3(12.5%)	35(21.3%)	14(10.7%)	52(16.3%)
46-55	12(50%)	56(34.1%)	38(29%)	106(33.2%)
56-65	6(25%)	53(32.3%)	51(38.9%)	110(34.4%)
66-75	0	10(6.1%)	28(21.4%)	38(11.9%)

From the above table, majority of patients with

Low score are in the age group of 46-55yrs (50%)

Intermediate score are in the age group of 56-65 yrs(34.1%)

High score are in the age group of 56-65 yrs(38.9%).

By applying CHI Square test P value <0.001 highly significant.

Higher the age, higher the NAFLD fibrosis risk score.

TABLE NO.10

COMPARISION OF THE COMPONENTS OF THE NAFLD FIBROSIS SCORE WITH GRADES OF FATTY LIVER

PARAMETERS	USG ABDOMEN	N	Mean	Std. Deviation	ANOVA Within and between groups
Age in years	Grade I	123	53.74	9.566	0.342
	Grade II	163	55.40	9.738	
	Grade III	33	54.06	10.458	
	Total	319	54.62	9.750	
BMI	Grade I	123	26.651	3.4032	<0.001
	Grade II	163	28.516	4.0529	
	Grade III	33	30.924	4.9677	
	Total	319	28.046	4.1255	
Platelet(10^9/L)	Grade I	123	208.63	58.070	0.335
	Grade II	163	199.82	60.667	
	Grade III	33	212.12	52.187	
	Total	319	204.49	58.878	
AST	Grade I	123	32.60	12.601	0.784
	Grade II	163	32.51	13.513	
	Grade III	33	34.21	11.736	
	Total	319	32.72	12.964	
ALT	Grade I	123	24.46	10.764	0.521
	Grade II	163	23.04	14.642	
	Grade III	33	25.18	8.647	
	Total	319	23.81	12.722	
Sr.Albumin	Grade I	123	4.040	.6927	0.013
	Grade II	163	3.940	.6140	
	Grade III	33	3.667	.6333	
	Total	319	3.950	.6542	
Nafld Fibrosis Score	Grade I	123	-.015327	.9814194	<0.001
	Grade II	163	.456294	1.0479672	
	Grade III	33	.580455	.9533483	
	Total	319	.287291	1.0389617	

The above table shows the NAFLD fibrosis score (P value <0.001), BMI (P value <0.001) and albumin(P value = 0.013) were statistically significant when compared within and between the groups using one way ANOVA.

TABLE N0.11

COMPARISION OF NAFLD SCORE COMPONENTS WITHIN AND BETWEEN LOW, INTERMEDIATE AND HIGH RISK GROUPS

PARAMETERS	NAFLD SCORE	N	Mean	Std. Deviation	ANOVA Within and between groups
Age in years	Low	24	49.92	8.997	<0.001
	Intermediate	164	52.41	9.710	
	High	131	58.25	8.743	
	Total	319	54.62	9.750	
BMI	Low	24	26.755	4.0139	0.072
	Intermediate	164	27.798	4.0325	
	High	131	28.592	4.2080	
	Total	319	28.046	4.1255	
Platelet(10^9/L)	Low	24	307.08	59.233	<0.001
	Intermediate	164	217.79	49.047	
	High	131	169.05	37.561	
	Total	319	204.49	58.878	
AST	Low	24	22.54	7.638	<0.001
	Intermediate	164	31.92	13.297	
	High	131	35.59	12.282	
	Total	319	32.72	12.964	
ALT	Low	24	22.71	8.715	0.211
	Intermediate	164	25.03	15.923	
	High	131	22.48	7.791	
	Total	319	23.81	12.722	
Sr.Albumin	Low	24	4.642	.3775	<0.001
	Intermediate	164	4.017	.6233	
	High	131	3.740	.6292	
	Total	319	3.950	.6542	
Nafld Fibrosis Score	Low	24	-1.972592	.5512643	<0.001
	Intermediate	164	-.137598	.5163673	
	High	131	1.233237	.4243921	
	Total	319	.287291	1.0389617	

When compared the individual components of the NAFLD fibrosis score within and between the various grades of the score(low, intermediate, high) using ANOVA it is found that BMI, platelet count, AST, albumin, NAFLD Score were statistically significant (P value <0.001).

TABLE N0.12

FREQUENCY DISTRBUSION OF FIBROSCAN LIVER STIFFNESS

Liver stiffness in kPa		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 6	16	3.2	16.0	16.0
	6-8	39	7.8	39.0	55.0
	8-12.5	40	8.0	40.0	95.0
	> 12.5	5	1.0	5.0	100.0
	Total	100	20.0	100.0	
Missing		400	80.0		
Total		500	100.0		

From the above table

16%were in the category of <6 kPa, low risk for fibrosis

39% were in the category of 6-8 kPa ,gray zone for fibrosis

40% were in the category of 8-12.5 kPa,F-3 fibrosis

5%were in the category of >12.5 kPa,F-4 fibrosis.

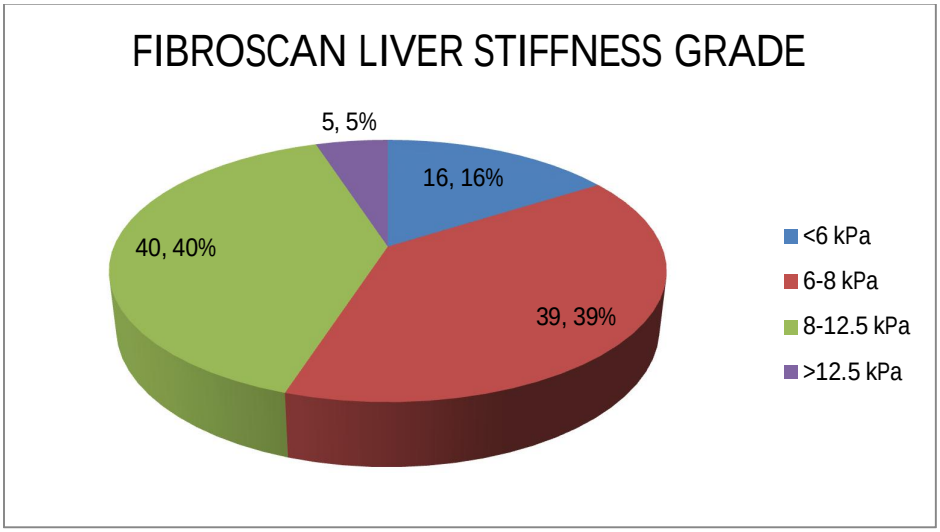


TABLE NO.13

AGE DISTRIBUTION AMONG FIBROSCAN LIVER STIFFNESS

Age group (years)	FIBROSCAN GRADE OF LIVER STIFFNESS				Total (n=100) %
	<6 kPa N=16	6-8 kPa N=39	8-12.5 kPa N=40	>12.5 kPa N=5	
26-35	1	2	1	0	4
36-45	5	7	6	2	20
46-55	5	10	17	1	33
56-65	4	15	13	2	34
66-75	1	5	3	0	9

The above table shows the distribution of the liver stiffness values of the fibroscan in various age groups. Among 100 patients who underwent fibroscan majority of them that is 33% and 34% were in the age group of 46-55 years and 56-65 years respectively.

TABLE NO.14

DISTRIBUTION OF COMPONENTS OF METABOLIC SYNDROME AND NAFLD FIBROSIS SCORE

VARIABLES		NAFLD FIBROSIS SCORE (N=319)%		
		LOW (n=24)	INTERMEDIATE(n=164)	HIGH (n=131)
BP>135/85	PRESENT	4(4.1%)	47(48.5%)	46(47.4%)
	ABSENT	20(9%)	117(52.7%)	85(38.3%)
CENTRAL OBESITY	PRESENT	19(6.6%)	146(50.7%)	123(42.7%)
	ABSENT	5(16.1%)	18(58.1%)	8(25.8%)
LOW HDL	PRESENT	10(6.5%)	74(47.7%)	71(45.8%)
	ABSENT	14(8.5%)	90(54.9%)	60(36.3%)
HYPERTRIGLY CERIDIMIA	PRESENT	13(5.8%)	105(46.9%)	106(47.3%)
	ABSENT	11(11.6%)	59(62.1%)	25(26.3%)
METABOLIC SYNDROME	PRESENT	14(6%)	108(46.4%)	111(47.6%)
	ABSENT	10(11.6%)	56(65.1%)	20(23.3%)

When comparing the risk of fibrosis with various components of metabolic syndrome and by applying CHI Square test hypertrigly-ceridemia is statistically significant **(p = 0.001)** overall metabolic syndrome was found to have highly significant **P value (<0.001).**

TABLE NO.15

COMPARISION OF GRADES OF FATTY LIVER WITH GRADES OF LIVER STIFFNESS (FIBROSCAN)

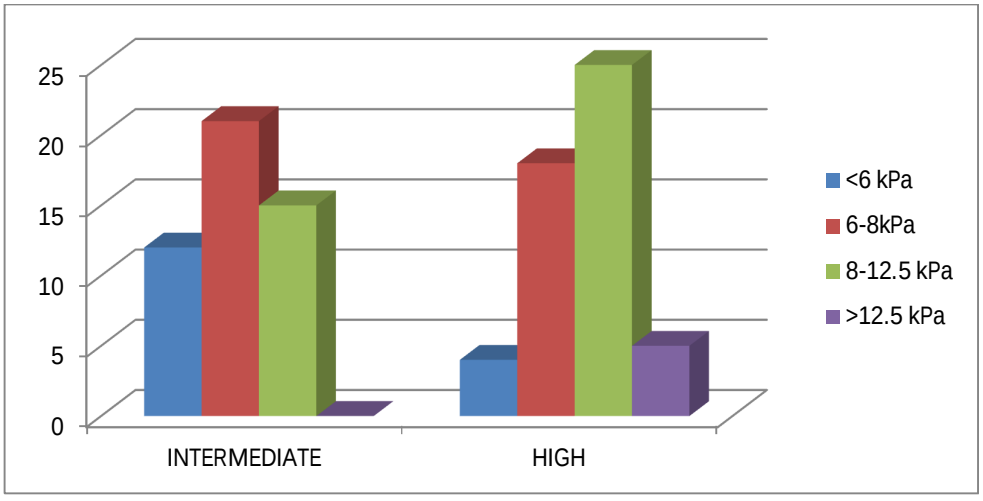
UsgAbd-Fatty Liver Grade		Fibroscan Findings (Liver Stiffness in kPa)				Total	Pearson Chi-Square
		< 6	6-8	8-12.5	> 12.5		
Grade II	Count	13	28	24	2	67	Value= 4.410(a)
	% within UsgAbd-Fatty Liver Grade	19.4%	41.8%	35.8%	3.0%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	81.3%	71.8%	60.0%	40.0%	67.0%	
Grade III	Count	3	11	16	3	33	Df = 3
	% within UsgAbd-Fatty Liver Grade	9.1%	33.3%	48.5%	9.1%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	18.8%	28.2%	40.0%	60.0%	33.0%	
Total	Count	16	39	40	5	100	P VALUE 0.220
	% within UsgAbd-Fatty Liver Grade	16.0%	39.0%	40.0%	5.0%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	100.0%	100.0%	100.0%	100.0%	100.0%	

A total of 100 patients were subjected to fibroscan among which 67 patients and 33 patients were in grade II and grade III respectively .By applying CHI square test ultrasound grades of fatty liver do not correlate with the fibroscan liver stiffness (P Value = 0.220).

TABLE NO.16

COMPARISION OF NAFLD FIBROSIS SCORE AND FIBROSCAN LIVER STIFFNESS

Risk of Fibrosis		Fibroscan Findings (Liver Stiffness in kPa)				Total	
		< 6	6-8	8-12.5	> 12.5		
Intermediate	Count	12	21	15	0	48	Pearson Chi-Square Value 11.589(a) Df = 3 P VALUE 0.009
	% within Risk of Fibrosis	25.0%	43.8%	31.3%	.0%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	75.0%	53.8%	37.5%	.0%	48.0%	
High	Count	4	18	25	5	52	
	% within Risk of Fibrosis	7.7%	34.6%	48.1%	9.6%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	25.0%	46.2%	62.5%	100.0%	52.0%	
Total	Count	16	39	40	5	100	
	% within Risk of Fibrosis	16.0%	39.0%	40.0%	5.0%	100.0%	
	% within Fibroscan Findings (Liver Stiffness in kPa)	100.0%	100.0%	100.0%	100.0%	100.0%	



By applying CHI Square test, indeterminate and high risk score correlate with high liver stiffness value (P = 0.009).

TABLE NO.17

COMPARISION OF NAFLD FIBROSIS SCORE WITH USG FATTY LIVER GRADING

Risk of Fibrosis		UsgAbd-Fatty Liver Grade			Total	
		Grade I	Grade II	Grade III		
Low	Count	12	12	0	24	Pearson Chi-Square VALUE 27.620 (a) Df =4 P VALUE 0.000
	% within Risk of Fibrosis	50.0%	50.0%	.0%	100.0%	
	% within UsgAbd-Fatty Liver Grade	9.8%	7.4%	.0%	7.5%	
Intermediate	Count	82	66	16	164	
	% within Risk of Fibrosis	50.0%	40.2%	9.8%	100.0%	
	% within UsgAbd-Fatty Liver Grade	66.7%	40.5%	48.5%	51.4%	
High	Count	29	85	17	131	
	% within Risk of Fibrosis	22.1%	64.9%	13.0%	100.0%	
	% within UsgAbd-Fatty Liver Grade	23.6%	52.1%	51.5%	41.1%	
Total	Count	123	163	33	319	
	% within Risk of Fibrosis	38.6%	51.1%	10.3%	100.0%	
	% within UsgAbd-Fatty Liver Grade	100.0%	100.0%	100.0%	100.0%	

By applying CHI Square test risk of fibrosis by NAFLD score correlates with the degree of fatty liver by ultrasound.(P <0.001 highly significant).

DISCUSSION

The present study entitled ‘’**CLINICAL PROFILE OF NON-ALCOHOLIC FATTY LIVER DISEASE AND NONINVASIVE ANALYSIS OF NAFLD FIBROSIS SCORE AMONG TYPE 2 DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL’’** was done in government Stanley medical college and hospital is a prospective study conducted in diabetic population attending diabetology outpatient clinic from April 2013 to March 2014.

During this study 500 eligible patients were assessed for the presence of fatty liver by ultrasound . 319 probable NAFLD patients were identified based on the ultrasound and graded on the scale of I-III standardised on a semi quantitative scale of assessment of hepatic involvement.

NAFLD is a new age epidemic and an alarming condition progressing to end stage liver disease, pathologically resembling alcoholic liver injury. Clinical implications are obtained for NAFLD mostly of its common prevalance in general population and its progression to cirrhosis and liver failure.

From a lot of clinical and experimental data NAFLD is considered as hepatic expression of the metabolic syndrome. Urbanisation and western life style including sedentary life and high fat diet which adversely affect the risk factors associated with metabolic syndrome and unmasks the genetic tendency that exists in Indian population.[97]

The gold standard is liver biopsy for the diagnosis of NAFLD. several studies compared the diagnostic utility of ultrasound imaging with liver biopsy and found a sensitivity of > 90% and specificity of > 80% [98].Patient will not convince for liver biopsy because it is invasive for a disease which is non-serious and mostly asymptomatic condition.

Diabetes is an additional risk for advanced NAFLD and patients with T2DM should be labelled as high risk group and screened for NASH .Very few studies from India on NAFLD patients with diabetes have correlated severity based on ultrasonogrpahy and studied the non invasive methods to identify the risk for high grade fibrosis.

The NAFLD Fibrosis Score , BARD, AST to Platelet Ratio Index(APRI), and FIB-4 are the more widely investigated non-invasive tools to cross-sectionally predict advanced fibrosis in NAFLD[5]. The NAFLD Score is based on six easily available parameters (Age, BMI,

hyperglycaemia, platelet count, albumin, AST/ALT ratio) and is clinically useful to identify NAFLD patients who have higher likelihood of bridging fibrosis and/or cirrhosis.[6]

There is an urgent need for using these non invasive scores in our population to identify advanced fibrosis in patients with NAFLD that may decrease the number of patients requiring liver biopsy to diagnose a milder form of the disease.

Since NAFLD is more prevalent among the diabetic patients than the general population and very few data are available on how to non invasively analyse and grade the risk of fibrosis, this study will give knowledge for planning an algorithmic approach based on the most frequently associated factors in this part of the country. The present study focuses on the ultrasound based screening for fatty liver and application of a NAFLD fibrosis score to grade the level of fibrosis. Further this predicted score is compared with fibroscan values of liver stiffness to assess the performance of the score to identify advanced fibrosis so as to apply in our population.

Distribution of severity of fatty liver on ultrasound:

In this study, 63.8% of the diabetic patients had fatty liver (NAFLD). **Mohan et al** reported the occurance of NAFLD in diabetics to be 54.5%.

Roliagarwal reported that 48.1%, 40.3% and 11.3% had grade I, II and III fatty liver respectively. This was comparable to the observations made in this study, in which 38.5% of them had grade I, 51 % had grade II and 10.3% had grade III fatty liver.

Age and sex:

In this study the mean age was found to be 54.62±9.75 and 52.65 among the NAFLD and non NAFLD group respectively. The majority of patients are in the age group of 56-65 years and 46-55 years in NAFLD and non NAFLD group respectively. In other Indian studies mean age was reported to be 42.90±10.54 years by **Roli Agarwal et al,** 40.9±11.1Years by **Bajaj et al**[115], 37.84±10.71 by **Ajay duseja et al.**[118] This difference of almost 10 years could be because our cases were from those who reported to our hospital for various ailments and not from a healthy subset of the population.

In this study majority are females i.e. 265 out of 319 (83.1%) in NAFLD group and 144 out of 181(79.6%) in Non NAFLD group. In an

Indian study by **D Amarapurkar et al** in which there was female preponderance of 52.2%**.** Female preponderance could be because major risk factors for the occurance and severity of NAFLD such as central obesity and diabetes are more in females. Western studies have also reported a female predominance in NAFLD patients.[163-177] Higher incidence in men was found by **Bacon et al** from Missouri, USA. Few studies have also reported an equal incidence in males and females like **Bajaj etal** (49% females).

Clinical signs and symptoms:

In our study group 125/319 (39.18%) patients were asymptomatic. Indian studies have reported 30.8 to 38% patients to be asymptomatic which is similar to the present study. Western studies have reported 47.7 to 64% patients to be asymptomatic which is higher than our study.[103,105-108]

In our study 194/319 (60.81%) patients had symptoms of liver disease, right upper abdominal pain or discomfort (47.02%), Fatigue (47.02%) and malaise (23.51%) were the dominant symptoms. **Amarapurkar et al**[114] reported 69.23% symptomatic patients having right hypochondriac pain as the presenting complaint. In the study by **Agarwal et al** 64% [119] patients were symptomatic and right upper

quadrant pain, fatigue and malaise were the main symptoms**. Powell et al**[105]reported 52.38% patients to be symptomatic having right upper quadrant pain, lethargy and nausea as the presenting complaints. In the study by **Bacon et al**[106] 36% were symptomatic and had right upper abdominal pain, malaise and fatigue.

Body mass index:

Mean BMI in our study was28.04$\pm$4.12 kg/$m^2$and 24.44$\pm$3.08 in NAFLD and non NAFLD group respectively. The mean BMI within the NAFLD group was found as Grade-I :26.65 $\pm$3.4 , Grade-II :28.51$\pm$4.05, Grade-III :30.92$\pm$4.96 respectively.

This study shows higher mean BMI in the NAFLD patients when compared with other Indian studies: **D amarapurkar et al** 26.6 ±5.1, **Bajaj et al** 26.7±4.4 and 26.7 by **Kaushal et al**[116]. When patients were classified by degree of obesity 46 out of 319(14.4%) of NAFLD patients were overweight(BMI=23-24.9),147 out of 319 (46.08%) were moderately obese (BMI=25-29.9) and 97 out of 319 (30.4%) patients were severely obese (BMI$\geq$30).There was statistical significance (P<0.001) when comparing the means of the BMI within the NAFLD cases using ANOVA. Studies have described obesity occurring anywhere from 60 to 100%.

DEMOGRAPHIC PROFILE OF CASES WITH NAFLD: INTERNATIONAL STUDIES

Author (*yr*)	Study design	N	Obese (%)	Diab-etes (%)	Trigly-ceride (%)	Female (%)	Sympt-omatic (%)	Advanced fibrosis (%)
Hilden et al.[99](1973)	Series (r)	32	NA	NA	NA	NA	NA	NA
Adler and Schaffner[100] (1979)	Case series (r)	29	100	2	48	76	NA	47
Ludwig et al.[101](1980)	Case series (r)	20	90	50	67	65	NA	15
Itoh et al.[102](1987)	Comparativ ecase series (r)	16	100	5	63	75	NA	19
Diehl et al.[103](1988)	Comparativ ecase series (r)	39	71	55	20	81	23	39
Lee [104] (1989)	Case series (r)	49	69	51	NA	78	0	34
Powell et al.[105] (1990)	Case series (r)	42	95	36	81	83	52	50
Bacon et al.[106](1994)	Case series (r)	33	39	21	21	42	36	39
Teli et al.[107] (1995)	Case series (r)	40	30	10	23	45	20	NA
Pinto et al.[108] (1996)	Case series (r)	32	34	34	28	75	6	55
Laurin et al.[109](1996)	CT (r)	40	70	28	NA	73	NA	NA
George et al.[110] (1998)	Case series (r)	151	NA	NA	NA	49	NA	NA
Angulo et al.[111](1999)	Case series (r)		60	28	NA	67	NA	27
Matteoni et al.[112](1999)	Case series (r)	132	NA	22	NA	52	NA	15
Garcia-Monzon et al.[113] (2000)	Case series (r)	41	NA	15	15	65	NA	10

ANTHROPOMETRIC AND BIOCHEMICAL DATA OF PATIENTS WITH NAFLD INDIAN STUDIES

variable	Deepak amar-papurkar et al[114]	S bajaj et al[115]	Kaushal madan et al[116]	Deepauchil et al a[117]	Ajay duseja et al[118]	Roliagraw al et al [119]
Age	39.1±12.3	40.1±11.1 82.1%	51		37.84±10.71	42.90±10.54
Sex(%)	47.8(M)	51(M)	46(M)	72(M)	-	64.5(M)
BMI(kg/m_2)	26.6±5.1	26.7±4.4	26.7 69.4%	28.58±4.25	20%(>24.9)	
Waist circumference (cm)	- 57.1%	89.2±13.9 58.9%	-	99.96±11.04 47.1%-ncep-atpIII	42%(>90-m: >80-f)	96.03±8.45 95%
Blood pressure (mmhg)	-	128.2±17.4/ 83.2±12.3 48.72%	11.8%	28.4%	10%(>130/85)	- -
Bilirubin	-	-	0.8	-	-	-
AST(IU/L)	19.2±4.5	-	66	37.41±14.50	57.8±29.2	76.05±41.74
ALT(IU/L)	24.3±9.8	-	98	38.74±17.96	76.3±27.9	100.31±43.74
Alk phosphatase (IU/L)	-	-	159	-	-	203.20±5.87
Albumin (gm%)	-	-	47	-	-	
Total Cholesterol (mgm%)	-	176.4±40.9	180	187.92±36.32	36%(>200 mgm%)	201.30±44.49
Triglyceride (mgm%)	-	136.4±68.9 23.1%	145 40.8%	170.02±88.90 43.6%	53%(>150 mgm%)	177.9161.12
HDL cholesterol (mgm%)	-	42.6±8.7 66.7%	41 36.4%	46.61±9.48 29.3%	66%(<40-f:<50-m)	45.0110.14
Metabolic syndrome	-	41%	20.9%	47.1%	50%	-

BIOCHEMICAL PROFILE OF CASES WITH NAFLD:

LABORATORY VALUES- INTERNATIONAL STUDIES

Author (*yr*)	Study design	N	Mean or median SAP IU/L	Mean or median AST IU/L	Mean or median ALT IU/L	Mean AST/ ALT ratio	Mean bilirubin mg/dL	Mean albumin gm/dL
Hilden et al.[99](1973)	Series (r)	32	NA	NA	NA	NA	NA	NA
Adler and Schaffner[100] (1979)	Case series (r)	29	144	100	120	0.83	NA	NA
Ludwig et al.[101](1980)	Case series (r)	20	170	72	38	1.89	0.5	NA
Itoh et al.[102] (1987)	Comparative case series (r)	16	NA	114	137	0.83	NA	NA
Diehl et al.[103](1988)	Comparative case series (r)	39	NA	NA	NA	NA	NA	Normal
Lee [104] (1989)	Case series (r)	49	103	89	104	0.85	0.7	4.2
Powell et al.[105](1990)	Case series (r)	42	108	70	96	0.73	1.18	NA
Bacon et al.[106](1994)	Case series (r)	33	139-202	52-122	64-224	NA	1.5-2.3	NA
Teli et al.[107] (1995)	Case series (r)	40	157	NA	37	NA	0.2	NA
Pinto et al.[108] (1996)	Case series (r)	32	NA	60	91	0.35	0.7	3.4
Laurin et al.[109](1996)	CT (r)	40	234 vs 298	70 vs 88	113 vs 93	NA	0.7 vs0.6	NA
George et al.[110] (1998)	Case series (r)	151	NA	53	96	0.54	NA	NA
Angulo et al.[111](1999)	Case series (r)		206	63	82	0.88	0.7	4.3
Matteoni et al.[112](1999)	Case series (r)	132	NA	Normal	58	NA	normal	normal
Garcia-Monzon et al.[113] (2000)	Case series (r)	41	190	NA	37	0.81	normal	normal

METABOLIC SYNDROME:

In this study, Metabolic syndrome (as per the NCEP ATP III modified criteria using Asian Indian standards)was present in 73% of the NAFLD patients and only 15.4% in non NAFLD patients. This observation was much higher when compared with other Indian studies: **Ajayduseja et al** (50%) and **Deepa uchilet al** (47.1%).

Among the NAFLD patients Grade I- 13%, Grade II- 95.7%, Grade III- 93.93% had metabolic syndrome. By applying CHI square test P value was <0.001 highly significant.

LABORATORY PARAMETERS:

Liver function tests:

In this study, mean AST was found to be 32.72$\pm$12.964, mean ALT was 23.81$\pm$12.722, mean albumin was 3.95$\pm$0.6542. If ALT <30 IU/l for men and <19 IU/l for women (Prati et al) is considered as normal ranges then elevation of serum transaminases was the most common biochemical abnormality in our patients. AST and ALT levels were elevated in 81.81% and 55.48 % of our patients respectively. **Roli Agrawal et al** reported elevated ALT and AST in 97.6% and 98.4%

respectively. Other studies have also reported a high incidence of raised AST/ALT levels in patients ranging from 85-88%.When the means of AST and ALT were compared in different grades of fatty liver, mean AST and ALT were not found to be statistically significant p value >0.05. This could be explained because the study population were taken from out patient department and most of them remained asymptomatic for liver disease.

Mofrad et al[120] studied NAFLD in two groups of patients. One group comprised of 51 cases having normal ALT levels and the second group comprised of 50 cases with raised ALT levels. A greater proportion of patients with normal ALT were asymptomatic compared to those with higher ALT levels who were symptomatic ($p<0.04$), thus further highlighting the fact that raised ALT levels are observed in symptomatic patients.

ANALYSIS OF NAFLD FIBROSIS SCORE:

Total 319 ultrasound detected NAFLD patients were analysed with the NAFLD fibrosis score in this study. Majority of the patients were identified to have intermediate (164/319 = 51.41%) and high risk (131/319 = 41.06%) of fibrosis. Most of the patients with Low score are in the age group of 46-55yrs (50%), intermediate score are in the age

group of 56-65 yrs(34.1%) and high score are in the age group of 56-65 yrs(38.9%).By applying CHI Square test P value <0.001 highly significant implies higher the age, higher the NAFLD fibrosis risk score.

When compared the individual components of the NAFLD fibrosis score within and between the various grades of the score (low, intermediate, high) using ANOVA it is found that BMI, platelet count, AST, albumin were statistically significant (P value <0.001).

In **kakrani et al**[121]study, the mean NAFLD fibrosis score with grade 1 fatty liver was -0.44, grade 2 fatty liver was -0.13, and grade 3 fatty liver was 0.15.

In our study the mean NAFLD fibrosis score with grade 1 fatty liver was -0.0153, grade 2 fatty liver was 0.4562, and grade 3 fatty liver was 0.5804.

COMPARISION OF NAFLD FIBROSIS SCORE WITH USG FATTY LIVER GRADING

In our study it is found that among the Grade I : 12/123 (9.7%),82/123 (66.6%),29/123(23.6%) had low, indeterminate and high score respectively, among the Grade II : 12/163 (7.36%),66/163 (40.5%),85/163 (52.14%)had low, indeterminate and high score

respectively, among the Grade III : 0(0%),16/33 (48.48%),17/33 (51.51%)had low, indeterminate and high score respectively.

By applying CHI Square test risk of fibrosis by NAFLD score correlates with the severity of fatty liver by ultrasound.(P <0.001 highly significant).Among the variables included in the score, BMI and albumin were correlated significantly. These results conflict with the previous study done by **kakrani et al**.[121]

In the study by **kakrani et al**, biochemical and imaging inpatients with NAFLD who were overweight with BMI of more than 25 were correlated.106 patients participated in this study were assessed in terms of imaging evidence of fatty liver, biochemical parameters, and NAFLD fibrosis score and BARD score.

The imaging changes were compared with the non-invasive scores of NAFLD. They found that, Out of two noninvasive scores, though both statistically non significant, NAFLD fibrosis score correlated better with the imaging changes as compared to the BARD score. But this relation was not found to be statistically significant. They concluded that imaging findings of fatty liver may not directly correlate with actual fibrosis in these patients.

LIVER STIFFNESS (LS) MEASUREMENT BY FIBROSCAN (TRANSIENT ELASTOGRAPHY):

Measuring LS is a simple, non-invasive and efficient method to identify individuals at high risk among NAFLD. In a study by **Masura baba et al**[122] 60 out of 416(14.3%) study participants had abnormal LS value .LS significantly and positively correlated with Liver Function test results and BMI. The LS was significantly higher among individuals with fatty liver, than without.

In our study a total of 184 patients were selected based on the grades of fatty liver by ultrasound (grade 2 and 3) who have intermediate and high risk for fibrosis predicted by the NAFLD score. 84 patients did not complete the fibroscan. Out of the 100 patients evaluated for the liver stiffness in our study,16%were in the category of <6 kPa, low risk for fibrosis, 39% were in the category of 6-8 kPa , gray zone for fibrosis, 40% were in the category of 8-12.5 kPa,F-3 fibrosis and 5%were in the category of >12.5 kPa,F-4 fibrosis.

Most of them that is 33% and 34% were in the age group of 46-55 years and 56-65 years respectively.

COMPARISION OF GRADES OF FATTY LIVER WITH GRADES OF LIVER STIFFNESS (FIBROSCAN):

Of the 100 patients, 67 patients and 33 patients were in grade II and grade III respectively. Most of the patients 16 out of 33(48.48%) with grade III fatty liver had LS in the range of 8-12.5 kPa and 28 out of 67 (41.79%) with grade II fatty liver had LS in the range of 6-8 kPa.

By applying CHI square test ultrasound grades of fatty liver do not correlate with the fibroscan liver stiffness (P Value = 0.220).

COMPARISION OF NAFLD FIBROSIS SCORE AND FIBROSCAN LIVER STIFFNESS:

In this study, of the total 100 patients who underwent fibroscan 48% had intermediate and 52% had high risk based on the NAFLD Score. Among the high risk 5 out of 52(9.61%) had LS >12.5 kPa (F4 fibrosis), 25 out of 52 (48.07%)had LS 8-12.5 kPa(F3 fibrosis).Among the intermediate risk none had LS >12.5 kPa and 15 out of 48(31.25%) had LS 8-12.5 kPa (F3 fibrosis).

By applying CHI Square test, indeterminate and high risk score correlate with high liver stiffness value (P = 0.009).

39 out of 100 (39%) had LS of 6-8 kPa in the gray zone who may need a liver biopsy to grade the degree of fibrosis whereas 61 out of 100 (61%)

had LS value <6 or >8 kPa falls in either low or significant fibrosis category hence liver biopsy can be avoided.

The NAFLD fibrosis score is a good non invasive predicting tool since it is correlating with the different grades of fatty liver by ultrasound and with the liver stiffness measurement by fibrosan. This observation should be analysed and verified in future studies because no large published series are available to support this finding.

Limitations:

The NAFLD score cannot accurately estimate and differentiate individual fibrosis stages and between histological evidence of steatohepatitis or a simple steatosis unlike a liver biopsy. Blood tests used in this score are known to fluctuate with time and non-liver-related conditions may change the blood indices(AST can be elevated even in muscle injury). Another drawback is Selection bias towards patients with high risk and more severe disease .The low risk with low grade fatty liver patients were not subjected for Fibroscan so the estimation of the sensitivity, specificity, positive predictive value, negative predictive value of the NAFLD Score to exclude advanced fibrosis could not be estimated. Low sample size because fibroscan could not be completed for all screened subjects.

CONCLUSIONS

The prevalence of non alcoholic liver disease among the diabetic population in this study was 63.8%higher compared to other series.

Majority are females 83.1% in contrast to other series and the common age group was 56-65 years. The mean BMI was 28.04±4.12 kg/m^2 and metabolic syndrome was present in 73%.

Among the laboratory parameters used in the NAFLD fibrosis score raised AST more than ALT(Ratio >1),low serum albumin, low platelet count, high BMI were statistically significant.

The non invasive NAFLD fibrosis score correlates significantly with the different grades of fatty liver detected by ultrasound and also with the liver stiffness measurement by transient elastography (Fibroscan).

By comparing the intermediate and high NAFLD fibrosis score with fibroscan liver stiffness, 61% had either low or significant fibrosis and hence an invasive liver biopsy could be avoided in these set of patients to grade the degree of fibrosis.

The combination of transient elastography (fibroscan) and NAFLD fibrosis scoring system may provide better performance than each of them used alone, in the non invasive analysis to select patients for whom to do a liver biopsy although this needs to be verified in future studies.

BIBLIOGRAPHY

1. Non-alcoholic fatty liver disease ,Claudia Della Corte et al, hepatology symposium,
2. Angulo P.Nonalcoholic fatty liver disease. N Engl J Med002;346 (16):1221-31
3. Prevalence of Fatty Liver Disease among Type 2 DiabetesMellitus Patients and its Relation to Insulin Resistance,S Merat et al, Middle East Journal of Digestive Diseases/ Vol.1/ No.2/ September 2009.
4. The NAFLD Fibrosis Score: A Noninvasive System That Identifies Liver Fibrosis in Patients with NAFLD,Paul Angulo et al, HEPATOLOGY, Vol. 45, No. 4, 2007.
5. Harrison SA, Oliver D, Arnold HL, et al. Development and validation of a simple NAFLD clinical scoring system for identifying patients without advanced disease. Gut 2008;57: 1441–1447.
6. Systematic review: the diagnosis and staging of non-alcoholic fatty liver disease and non-alcoholic steatohepatitis, J. K. Dowman et al,Aliment Pharmacol Ther 2011; 33: 525–540.
7. Angelico F, Del Ben M, Conti R, Francioso S, Feole K, Maccioni D, Antonini TM, Alessandri C. Non-alcoholic fatty liver

syndrome: a hepatic consequence of common metabolic diseases. J GastroenterolHepatol2003; 18: 588-594.

8. Roliagrawal et al association of NAFLD with obesity Indian J. prev. soc med. Vol.39 no 1 &2, 2008.
9. Stephen h , Caldwell et al, non alcoholic fatty liver disease schiffs disease of the liver tenth edition vol 2 pg1117-1167.
10. Zelman S. The liver in obesity. Arch Intern Med 1958;90:141–156.
11. Ludwig J, Viggiano TR, McGill DB, Oh BJ. Nonalcoholic steatohepatitis: Mayo Clinic experiences with a hitherto unnamed disease. Mayo Clin Proc 1980;55:434–438.
12. Overview: an introduction to NASH and related fatty liver disordersGeoffrey C. Farrell, et al, book- First published 2005.
13. Nomura H, Kashiwagi S, Hayashi J, Kajiyama W, Tani S, Goto M. Prevalence of fatty liver in a general population of Okinawa, Japan. Jpn J Med 1988;27:142-9.
14. Bellentani S, Saccoccio G, Masutti F, et al. Prevalence of and risk factors for hepatic steatosis in northern Italy. Ann Intern Med 2000;132:112-7.
15. Luyckx FH, Desaive C, Thiry A, et al. Liver abnormalities in severely obese subjects: effect of drastic weight loss after gastroplasty. Int J Obes Relat Metab Disord 1998;22:222-6.

16. Daniel S, Ben-Menachem T, Vasudevan G, Ma CK, Blumenkehl M. Prospective evaluation of unexplained chronic liver transaminase abnormalities in asymptomatic and symptomatic patients. Am J Gastroenterol 1999; 94:3010-4.

17. Flegal KM, Carroll MD, Kuczmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960-1994. Int J Obes Relat Metab Disord 1998;22:39-47.

18. Wanless IR, Lentz JS. Fatty liver hepatitis (steatohepatitis) and obesity: an autopsy study with analysis of risk factors. Hepatology 1990;12:1106-10.

19. Silverman JF, O'Brien KF, Long S, et al. Liver pathology in morbidly obese patients with and without diabetes. Am J Gastroenterol 1990;85: 1349-55.

20. GI Epidemiology: nonalcoholic fatty liver disease,P. ANGULO, Aliment PharmacolTher 25, 883–889.

21. Chitturi S, Farrell GC, George J. Non-alcoholic steatohepatitis in the Asia-Pacific region: future shock? J Gastroenterol Hepatol 2004; 19 : 368-74.

22. Amarapurkar A, Ghansar T. Fatty liver: experience from western India. Ann Hepatol 2007; 6 : 37-40

23. Singh SP, Navak S, Swain M, Rout N, Mallik RN, Agrawal O, et al. Prevalence of nonalcoholic fatty liver disease in coastal eastern India: a preliminary ultrasonographic survey. Trop Gasteroenterol 2004; 25 : 76-9.

24. Misra A, Vikram NK. Insulin resistance syndrome (metabolic syndrome) and Asian Indians. CurrSci 2002; 83 : 1483-96.

25. Mishra S. Hyperinsulinemia predisposes to NAFLD. Indian J ClinBiochem 2008;23:130-5.

26. Mohan V, Farooq S, Deepa M et al. Prevalence of non-alcoholic fatty liver disease in urban south Indians in relation todifferent grades of glucose intolerance and metabolic syndrome. Diabetes Res ClinPract. 2009;84:84-91

27. Gupte P. Non-alcoholic steatohepatitis in type 2 diabetes mellitus. J GastroenterolHepatol 2004;19:854–8.

28. Prashanth M Ganesh HK, Vima MV, et al. Prevalence of nonalcoholic fatty liver disease in patients with type 2 diabetesmellitus. J Assoc Physicians India. 2009;57:205-10.

29. Banerjee S, Ghosh US, Dutta S..Clinicopathological profile of hepatic involvement in type-2 diabetes mellitus and itssignificance. J Assoc Physicians India. 2008;56:593-9.

30. Vikram NK, Misra A, Pandey RM, Dwivedi M, Luthra K, Dhingra V, et al. Association between subclinical inflammation & fasting insulin in urban young adult north Indian males. Indian J Med Res 2006; 124 : 677-82.

31. Garg A, Misra A. Hepatic steatosis, insulin resistance and adipose tissue disorders. J ClinEndocrinolMetab 2002; 87 : 3019-22.

32. Silverman JF, Pories WJ, Caro JF. Liver pathology in diabetes mellitus and morbid obesity: clinical, pathological and biochemical considerations. PatholAnnu 1989;24:275-302.

33. Angulo P. NAFLD, obesity and bariatric surgery. Gastroenterology 2006; 130:1848.

34. Fatty liver disease NASH and related disorders ,Geoffrey C. Farrell, et al, book, NASH is a genetically determined disease, 66,Christopher P. Day & Ann K. Daly.

35. Fatty liver disease NASH and related disorders ,Geoffrey C. Farrell, et al, book, Fatty acid metabolism and lipotoxicity in the pathogenesis of NAFLD/NASH, 109,Nathan M. Bass & Raphael B. Merriman.

36. Day CP. Pathogenesis of steatohepatitis. Balliere's Best Pract Res ClinGastroenterol2002; 16: 663–78

37. Fatty liver disease NASH and related disorders ,Geoffrey C. Farrell, etal, book, Cell biology of NASH: fibrosis and cell proliferation, 143 Isabelle A. Leclercq & Yves Horsmans.

38. Matteoni CA, Younossi ZM, Gramlich T et al. Nonalcoholic fatty liver disease: a spectrum of clinical and pathological severity. Gastroenterology 1999; 116:1413–9.

39. Fatty liver disease NASH and related disorders ,Geoffrey C. Farrell, etal, book, The clinical outcome of NAFLD including cryptogenic cirrhosis,168Stephen H. Caldwell & Anita Impagliazzo Hylton.

40. Fatty liver disease NASH and related disorders ,Geoffrey C. Farrell, etal, book Practical approach to the diagnosis and management of people with fatty liver diseases, 181 Jacob George & Geoffrey C. Farrell.

41. Reid AE. Non alcoholicsteato hepatitis. Gastroenterology 2001;121:710-723

42. Sanyal AJ. AGA technical review on nonalcoholic fatty liver disease. Gastroenterology. 2002;123:1705-25.

43. Pratt DS, Kaplan MM. Evaluation of abnormal liver-enzyme nresults in asymptomatic patients. N Engl J Med. 2000;342:1266–1271.

44. Torres DM, Harrison SA. Diagnosis and therapy of non-alcoholic steatohepatitis. Gastroenterology. 2008;134:1682–1698.

45. Pantsari MW, Harrison SA. Nonalcoholic fatty liver disease presenting with an isolated elevated alkaline phosphatase. J ClinGastroenterol. 2006;40:633–635.

46. Simple Noninvasive Systems Predict Long-term Outcomes of Patients With Nonalcoholic Fatty Liver Disease,Paul Angulo, Elisabetta Bugianesi, Einar S. Bjornsson, Phunchai Charatcharoenwitthaya, Gastroenterology 2013;145:782–789.

47. Simple non-invasive fibrosis scoring systems can reliably exclude advanced fibrosis in patients with non-alcoholic fatty liver disease, Stuart McPherson, Stephen F Stewart, Elsbeth Henderson, Alastair D Burt, Christopher P Day Gut 2010;59:1265e1269.

48. Palekar NA, Naus R, Larson SP, Ward J, Harrison SA. Clinical model for distinguishing nonalcoholicsteatohepatitis from simple steatosis in patients with nonalcoholic fatty liver disease. Liver Int. 2006;26:151–156.

49. Poynard T, Ratziu V, Naveau S, et al. The diagnostic value of biomarkers (steatotest) for the prediction of liver steatosis. CompHepatol. 2005;4:10

50. Ratziu V, Massard J, Charlotte F, et al. Diagnostic value of biochemical markers (fibrotest-fibrosure) for the prediction of liver fibrosis in patients with non-alcoholic fatty liver disease. BMC Gastroenterol. 2006;6:6.

51. Adams LA, Mac Quillan GC, Jeffrey GP, George J, van der Poorten D, Kench JG, Rossi E, De Boer B. Non-invasive prediction of liver fibrosis in nonalcoholic fatty liver disease: The 59th Annual Meeting of the American Association for the Study of Liver Diseases. San Francisco, CA, 2008.

52. Harrison SA, Oliver D, Arnold HL, Gogia S, Neuschwander- Tetri BA. Development and validation of a simple NAFLD clinical scoring system for identifying patients without advanced disease. Gut. 2008;57:1441–1447.

53. NAFLD Fibrosis Score: Is It Ready for Wider Use in Clinical Practice and for Clinical Trials? SAMER GAWRIEH, NAGA CHALASANI.

54. Are simple noninvasive scoring systems for fibrosis reliable in patients with NAFLD and normal ALT levels? Stuart McPherson, Quentin M. Anstee, Elsbeth HendersonChristopher P. Dayand Alastair D. Burt

55. Schuppan D, Afdhal N H. Liver cirrhosis, Lancet 2008;371(9615):838-851.

56. Saadeh S, Younossi ZM, Remer EM, et al. The utility of radiological imaging in nonalcoholic fatty liver disease.Gastroenterology.2002;123:745–750.

57. Mottin CC, Moretto M, Padoin AV, et al. The role of ultrasound in the diagnosis of hepatic steatosis in morbidly obese patients. Obes Surg. 2004;14:635–637.

58. Palmentieri B, de Sio I, La Mura V, et al. The role of bright liver echo pattern on ultrasound B-mode examination in the diagnosis of liver steatosis. Dig Liver Dis. 2006; 38:485–489.

59. Zelber-Sagi S, Webb M, Ratziu V, Poynard T, Halpern Z, Oren R. A comparison between the hepatorenal ultrasound index and steatotest for the non-invasive quantification of liver steatosis: The 43rd Annual Meeting of the European Association for the Study of the Liver. Milan, Italy, 2008.

60. Osawa H, Mori Y. Sonographic diagnosis of fatty liver using a histogram technique that compares liver and renal cortical echo amplitudes. J Clin Ultrasound. 1996; 24:25–29.

61. Webb M, Hanny Yeshua H, Zelber-Sagie S, Santo M, Barazovski E, Katz R, Halpern Z, Oren R. A practical index for ultrasono

graphic quantification of liver steatosis The 58th Annual Meeting of the American Association for the Study of Liver Diseases. Boston, MA, 2007.

62. Iijima H, Moriyasu F, Tsuchiya K, et al. Decrease in accumulation of ultrasound contrast microbubbles in non-alcoholic steatohepatitis. Hepatol Res. 2007; 37:722–730.

63. Saverymuttu SH, Joseph AE, Maxwell JD. Ultrasound scanning in the detection of hepatic fibrosis and steatosis. BMJ 1986;292: 13-15.

64. Leen E, Goldberg JA, Angerson WJ, McArdle CS. Potential role of Doppler perfusion index in selection of patients with colorectal cancer for adjuvant chemotherapy. Lancet. 2000; 355:34–37.

65. Bellentani S, Dugoni M, Miglioli L, anderlini R, Mariano M, Borelli L, Battistini NC. Doppler perfusion index (dpi) is highly predictive of the grade of fatty liver in overweight patients with NAFLD: 43rd Annual Meeting of the European Association for the Study of the Liver. Milan, Italy, 2008.

66. Dugoni M, Miglioli L, Borelli L, et al. Doppler perfusion index (DPI) and homa are highly predictive of fatty liver in patients with NAFLD. Dig Liver Dis. 2007; 40:A39.

67. Kakkos SK, Yarmenitis SD, Tsamandas AC, Gogos CA, Kalfarentzos F. Fatty liver in obesity: relation to Doppler perfusion index measurement of the liver. Scand J Gastroenterol. 2000; 35:976–980.

68. Piekarski J, Goldberg HI, Royal SA, Axel L, Axel L, Moss AA. Difference between liver and spleen CT numbers in the normal adult: its usefulness in predicting the presence of diffuse liver disease. Radiology. 1980;137:727–729.

69. Park SH, Kim PN, Kim KW, et al. Macrovesicular hepatic steatosis in living liver donors: use of CT for quantitative and qualitative assessment. Radiology. 2006; 239:105–112.

70. Lee SW, Park SH, Kim KW, et al. Unenhanced CT for assessment of macrovesicular hepatic steatosis in living liver donors: comparison of visual grading with liver attenuation index. Radiology. 2007;244:479–485.

71. Jacobs JE, Birnbaum BA, Shapiro MA, et al. Diagnostic criteria for fatty infiltration of the liver on contrast-enhanced helical CT. AJR Am J Roentgenol. 1998; 171:659–664.

72. Fishbein M, Castro F, Cheruku S, et al. Hepatic MRI for fat quantitation: its relationship to fat morphology, diagnosis, and ultrasound. J Clin Gastroenterol. 2005; 39:619–625.

73. Longo RPP, Ricci C, et al. Proton MR spectroscopy in quantitative in vivo determination of fat content in human liver steatosis. J Magn Reson Imaging. 1994; 5:281–285.

74. Szczepaniak LS, Nurenberg P, Leonard D, et al. Magnetic resonance spectroscopy to measure hepatic triglyceride content: prevalence of hepatic steatosis in the general population. Am J Physiol Endocrinol Metab. 2005; 288: E462–E468.

75. Browning JD, Szczepaniak LS, Dobbins R, et al. Prevalence of hepatic steatosis in an urban population in the United States: impact of ethnicity. Hepatology. 2004;40:1387–1395.

76. Manduca A, Oliphant TE, Dresner MA, et al. Magnetic resonance elastography: non-invasive mapping of tissue elasticity. Med Image Anal. 2001; 5:237–254.

77. Yin M, Talwalkar JA, Glaser KJ, et al. Assessment of hepatic fibrosis with magnetic resonance elastography. Clin Gastroenterol Hepatol. 2007; 5:1207–1213. e1202.

78. Brunt EM, Janney CG, Di Bisceglie AM, Neuschwander-Tetri BA, Bacon BR. Nonalcoholic steatohepatitis: a proposal for grading and staging the histological lesions. Am J Gastroenterol. 1999;94:2467–2474.

79. Liver stiffness: a novel parameter for the diagnosis of liver disease,Hepatic Medicine: Evidence and Research may 2010: 249–67.

80. Operator training requirements and diagnostic accuracy of Fibroscan in routine clinical practice,Armstrong MJ, et al. Postgrad Med J 2013;89:685–692.

81. Tsochatzis EA, Gurusamy KS, Ntaoula S, et al. Elastography for the diagnosis of severity of fibrosis in chronic liver disease: a meta-analysis of diagnostic accuracy. J Hepatol 2011;54:650–9.

82. Friedrich-Rust M, Ong M-F, Martens S, et al. Performance of transient elastography for the staging of liver fibrosis: a meta-analysis. Gastroenterology2008;134:960–74.

83. Talwalkar JA, Kurtz DM, Schoenleber SJ, et al. Ultrasound-based transient elastography for the detection of hepatic fibrosis: systematic review and meta-analysis. Clin Gastroenterol Hepatol 2007;5:1214–20.

84. Liver elastography, comments on EFSUMB elastography guidelines 2013, Cui XW et al . October 14, 2013 Volume 19 Issue 38.

85. Castéra L, Vergniol J, Foucher J, Le Bail B, Chanteloup E, Haaser M, Darriet M, Couzigou P, De Lédinghen V. Prospective

comparison of transient elastography, Fibrotest, APRI, and liver biopsy for the assessment of fibrosis inchronic hepatitis C. Gastroenterology 2005;128: 343-350 [PMID:15685546]

86. Wong GL. Transient elastography: Kill two birds with one stone? World J Hepatol 2013;5: 264-274 [PMID: 23717737 DOI:10.4254/wjh.v5.i5.264].

87. Wong GL, Vergniol J, Lo P, Wai-Sun Wong V, FoucherJ, Le Bail B, Choi PC, Chermak F, Leung KS, MerroucheW, Chan HL, de Lédinghen V. Non-invasive assessment of liver fibrosis with transient elastography (Fibro Scan): applying the cut-offs of M probe to XL probe. Ann Hepatol 2013;12:570-580 [PMID: 23813135].

88. Fraquelli M, Rigamonti C, Casazza G, Conte D, Donato MF, Ronchi G, Colombo M. Reproducibility of transient elastography in the evaluation of liver fibrosis in patients with chronic liver disease. Gut2007;56: 968-973 [PMID: 17255218DOI: 10.1136/gut.2006.111302.

89. Takeda T, Yasuda T, Kimura M, Nakaya M, Fujii H, NakayamaY, Sakaguchi H, Seki S. Noninvasive diagnosis of non-alcoholic steatohepatitis using elastometry The 58th Annual Meeting of the

American Association for the Study of the Liver. Boston, MA, 2007.

90. Fukuzawa Y, Kizawa S, Ohashi T, Matsumoto E, Sato K, Ayada M, Hotta N, Okumura A, Ishikawa T, Kakumu S. Efficacy of non-invasive hepatic fibrosis quantificated evaluation by liver elasticity measurement in non-alcoholic steatohepatitis (NASH)- comparison of ultrasonic transient elastography and histopathological diagnosis: The 58th Annual Meeting of the Association for the Study.

91. Palmeri ML, Wang MH, Dahl JJ, Frinkley KD, Nightingale KR. Quantifying hepatic shear modulus in vivo using acoustic radiation force. Ultrasound Med Biol 2008;34: 546-558[PMID: 18222031 DOI: 10.1016/j.ultrasmedbio.2007.10.009].

92. Toshima T , Shirabe K, Takeishi K, Motomura T, Mano Y,Uchiyama H, Yoshizumi T, Soejima Y, Taketomi A, Maehara Y. New method for assessing liver fibrosis based on acoustic radiation force impulse: a special reference to the difference between right and left liver. J Gastroenterol 2011;46: 705-711[PMID: 21264479 DOI: 10.1007/s00535-010-0365-7].

93. Yoneda M, Suzuki K, Kato S, Fujita K, Nozaki Y, Hosono K, Saito S, Nakajima A. Nonalcoholic fatty liver disease: US-based

acoustic radiation force impulse elastography. Radiology 2010;256: 640-647 [PMID: 20529989 DOI: 10.1148/ radiol.10091662].

94. Friedrich-Rust M , Romen D, Vermehren J, Kriener S, Sadet D, Herrmann E, Zeuzem S, Bojunga J. Acoustic radiation force impulse-imaging and transient elastography for noninvasive assessment of liver fibrosis and Steatosis in NAFLD. Eur J Radiol 2012;81: e325.

95. BercoffJ ,Pernot M, Tanter M, Fink M. Monitoring thermally-induced lesions with supersonic shear imaging. Ultrason Imaging 2004;26: 71-84 [PMID: 15344412].

96. Bercoff J, Tanter M, Fink M. Supersonic shear imaging: a new technique for soft tissue elasticity mapping. *I*EEE Trans Ultrason Ferroelectr Freq Control 2004;51: 396-409 [PMID:15139541].

97. Ajay duseja et al The Clinicopathological Profile of Indian Patients with Nonalcoholic Fatty Liver Disease (NAFLD) is Different from That in the West Dig Dis Sci (2007) 52:2368–2374.

98. Llorenccaballeria et al: Risk factors associated with NAFLD in primary health care units. A case control study. BMC Gastroenterology 2008 8:44.

99. Hilden M, Juhl E, Thomen AC, Christoffersen P. Fatty liver persisting for up to 33 years. Acta Med Scand 1973;194:485–489.

100. Adler M, Schaffner F. Fatty liver hepatitis and cirrhosis in obese patients. Am J Med 1979;67:811–816.

101. Ludwig J, Viggiano TR, McGill DB, Oh BJ. Nonalcoholic steatohepatitis: Mayo Clinic experiences with a hitherto unnamed disease. Mayo ClinProc 1980;55:434–438.

102. Itoh S, Yougel T, Kawagoe K. Comparison between non-alcoholic steatohepatitis and alcoholic hepatitis. Am J Gastroenterol 1987;82:650–654.

103. Diehl AM, Goodman Z, Ishak KG. Alcoholic liver disease in nonalcoholics. A clinical and histologic comparison with alcoholinduced liver injury. Gastroenterology 1988;95:1056–1062.

104. Lee RG. Nonalcoholic steatohepatitis:a study of 49 patients. Hum Pathol 1989; 20:594–598.

105. Powell EE, Cooksley WG, Hanson R, Searle J, Halliday JW, Powell LW. The natural history of non-alcoholic steatohepatitis: a follow-up study of forty-two patients for up to 21 years. Hepatology 1990;11:74–80.

106. Bacon BR, Farahvash MJ, Janney CG, Neuschwander Tetri BA. Nonalcoholic steatohepatitis: an expanded clinical entity. Gastroenterology 1994;107:1103–1109.

107. Teli MR, James OF, Burt AD, Bennett MK, Day CP. The natural history of nonalcoholic fatty liver:a follow-up study. Hepatology 1995;22:1714–1719.

108. Pinto HC, Baptista A, Camilo ME, Valente A, Saragoca A, de Moura MC. Nonalcoholic steatohepatitis. Clinico pathological comparison with alcoholic hepatitis in ambulatory and hospitalized patients. Dig Dis Sci 1996;41:172–179.

109. Laurin J, Lindor KD, Crippin JS, Gossard A, Gores GJ, Ludwig J. Ursodeoxycholic acid or clofibrate in the treatment of non-alcohol induced steatohepatitis:a pilot study. Hepatology 1996;23: 1464–1467

110. George DK, Goldwurm S, MacDonald GA, Cowley LL, Walker NI, Ward PJ, Jazwinska EC, Powell LW. Increased hepatic iron concentration in nonalcoholicsteatohepatitis is associated with increased fibrosis. Gastroenterology 1998;114:311–318.

111. Angulo P, Keach JC, Batts KP, Lindor KD. Independent predictors of liver fibrosis in patients with non-alcoholic steatohepatitis. Hepatology 1999;30:1356–1362.

112. Matteoni CA, Younossi ZM, Gramlich T, Boparai N, Liu YC, McCullough AJ. Nonalcoholic fatty liver disease: a spectrum of clinical and pathological severity. Gastroenterology 1999;116: 1413–1419

113. Garcia-Monzon C, Martin-Perez E, Iacono OL, Fernandez-Bermejo M, Majano PL, Apolinario A, Larranaga E, Moreno-Otero R. Characterization of pathogenic and prognostic factors of non-alcoholic steatohepatitis associated with obesity. J Hepatol 2000;33:716–724.

114. Amarapurkar et al Prevalence of non-alcoholic fatty liver disease: population based studyD Amarapurkar et al. Prevalence of non-alcoholic fatty liver disease 161Annals of Hepatology 2007; 6(3): July-September

115. S bajaj et al A case-control study on insulin resistance, metabolic co-variates& prediction score in non-alcoholic fatty liver disease Indian J Med Res 129, March 2009, pp 285-292

116. Kaushal et al Non-alcoholic fatty liver disease may not be a severe disease at presentation among Asian IndiansWorld J Gastroenterol2006 June 7; 12(21): 3400-3405

117. Deepauchil et al Non-Alcoholic Fatty Liver Disease (NAFLD) — The Hepatic Component of Metabolic Syndrome JAPI ;MARCH 2009 ; VOL. 57 201-204

118. Ajay duseja et al The Clinico pathological Profile of Indian Patients with Nonalcoholic Fatty Liver Disease (NAFLD) is Different from That in the WestDig Dis Sci (2007) 52:2368–2374.

119. Roliagrawal et al association of NAFLD with obesity Indian J. prev. soc med. Vol.39 no 1 &2, 2008.

120. Mofrad et al, Clinical and histologic spectrum of nonalcoholic fatty liver disease associated with normal ALT values journal of Hepatologyvol 37, IS - 6 EP - 1292,2003.

121. Kakrani, et al.: NAFLD fibrosis score and BARD score in relation with USG evidence of non-alcoholic fatty liver.International Journal of Medicine and Public Health Apr-Jun 2013 Vol 3 Issue2.

122. Discrimination of individuals in a general population at high-risk for alcoholic and non-alcoholic fatty liver disease based on liver stiffness: a cross section study, Masaru Baba, BMC Gastroenterology 2011, 11:70.

CLINICAL PROFILE OF NON-ALCOHOLIC FATTY LIVER DISEASE AND NONINVASIVE ANALYSIS OF NAFLD FIBROSIS SCORE AMONG TYPE 2 DIABETIC PATIENTS IN A TERTIARY CARE HOSPITAL

THESIS PROFORMA

GUIDE: **CANDIDATE**:

General information

Name : Subject Id:

Age/sex :

Hospital No :

Address : Phone:

Occupation :

Literacy :

Per capita income:

Religion : Hindu/Muslim/Christian/Others

Diet :Veg/Non Veg/Mixed

Present history

S.NO	SYMPTOMS	PRESENT	ABSENT	DURATION
1	Abdominal pain			
2	Abdominal Distention			
3	Dyspepsia(ulcer/reflux/dysmotility)			
4	UGI bleeding			
5	Jaundice			
6	Oedema legs			

7	Cardiovascular • chest pain • dyspnoea on exertion • guidiness			
8	Diabetic Complications • Retinopathy • Nephropathy • Neuropathy			
9	Obesity complications • joint pain • constipation • CVA			

Past history

H/O	**DURATION**	**DRUGS**	
T2DM		OHA	INSULIN
SHT			
IHD			
DYSLIPIDEMIA			
CHRONIC LIVER DISEASE			
TUBERCULOSIS			
BRONCHIAL ASTHMA			
MALIGNANCY			
THYROID DISORDER			
CHRONIC RENAL DISEASE			

Any other Drugs:

☐ Steroids	☐ Heparin	☐ Anti-viral
☐ Estrogen	☐ Valproic acid	☐ Parentral nutrition

H/O:

☐ Jaundice	☐ Blood Transfusion	☐ HBV
☐ Abdominal Surgery	☐ Starvation	☐ HCV

Family H/O:

☐ Liver Disease	☐ HCV	☐ Hypertension
☐ HBV	☐ Diabetes	☐ IHD

Personal H/O:

S.No	H/O	Present	Absent	Duration	Amount
1	**Smoking**				
2	**Alcohol**				
3	**I/V drug abuse**				

Appetite : ☐ Normal ☐ Lost

Bladder : ☐ Normal ☐ Abnormal

Bowel : ☐ Normal ☐ Abnormal

Sexual History : ☐ Significant ☐ In-Significant

GENERAL EXAMINATION:

Anthropomerty

S.No	Parameter	Value	Comment	
1	**Height (m)**			
2	**Weight (kg)**			
3	**BMI (kg/m^2)**		**>23**	☐
4	**Waist Circumference (cm)**		**Men > 90 cm** **Women > 80 cm**	☐ ☐

Vital signs :

Pulse: ☐ /min ☐ / ☐ Hg

Pallor ☐ Icterus ☐ Cyanosis ☐ Clubbing ☐ Edema ☐

JVP ☐ mphnodes Ha☐ Skin ☐ ☐

Peripheral Signs of liver cell failure if any …….....

Systemic Examination:

PA **:** Tender ☐ Ascites ☐ Liver ☐ Spleen ☐

CVS **:** S1S2 M☐mur ☐

RS **:**NVBS ☐ Added Sounds ☐ Effusion ☐

CNS **:**HMF ☐ Motor ☐ Sensory ☐ Peripheral Neuropathy ☐

INVESTIGATIONS:

S.NO	INVESTIGATION	VALUES
1.	Hb	
2.	TLC	
3.	DLC	
4.	PLATELET	
5.	ESR	
6.	PT	
7.	INR	
8.	LFT- • SR.BIL TOTAL/DIRECT	
	• SGOT/SGPT	
	• SAP/GGT	
	• T.PRO/ALB/GLB	
9.	BLOOD SUGAR FBS/ PPBS/ RBS	
10.	BLOOD UREA	
11.	CREATININE	
12.	HBSAG	
13.	ANTI-HCV	
14.	URINE ANALYSIS	
15.	ASCITIC FLUID ANALYSIS T.PRO/ALB/SUGAR TLC/DLC	
16.	FASTING LIPIID PROFILE • TOTAL CHOLESTEROL	
	• Sr.TGL	
	• LDL	
	• VLDL	
	• HDL	

S.NO	INVESTIGATION	REPORT
1	**E C G**	
2	**USG ABDOMEN**	1. **Fatty Liver** a. **Gr.1** (Mild Steatosis) ☐ b. **Gr.2** (Moderate Steatosis) ☐ c. **Gr.3** (Severe Steatosis) ☐ 2. **Cirrhosis** ☐ 3. **Ascites** ☐ 4. **Spleenomegaly** ☐
3	**PV DOPPLER** **(OPTIONAL)**	
4	**OGD SCOPY** **(OPTIONAL)**	
5	**CT SCAN ABDOMEN** **(OPTIONAL)**	
6	**MRI ABDOMEN** **(OPTIONAL)**	
7	**ANY OTHER (OPTIONAL)** [LIVER BIOPSY / FIBROSCAN]	

FORMULA:

NAFLD fibrosis score= -1.675 + 0.037 ×age (years) + 0.094 × BMI (kg/m2) + 1.13 × IFG/diabetes (yes=1, no= 0) +0.99 × AST/ALT ratio- 0.013 × platelet (×10^9/l) -0.66 ×albumin (g/dl).

AGE : **AST/ALT ratio :**

BMI : **Platelet (×10^9/l) :**

IFG/diabetes (yes=1, no= 0): **Albumin (g/dl) :**

NAFLD fibrosis score=

<-1.455	Low Risk	☐
-1.455 to 0.676	Intermediate	☐
>0.676	High Risk	☐

Metabolic Syndrome: **Present** ☐ **Absent** ☐

FIBROSCAN LIVER STIFFNESS: <6kPa / 6-8kPa / 8-12.5kPa / >12.5kPa.

FINAL DIAGNOSIS:

GUIDE: **INVESTIGATOR:**

Consent Form

I agree to participate in the study titled - "**clinical profile of non-alcohoic fatty liver disease and noninvasive analysis of NAFLD fibrosis score among type 2 diabetic patients in a tertiary care hospital**"

I confirm that I have been told about this study in my mother tongue and have had the opportunity to ask question.

I understand that my participation is voluntary and I may refuse to participate at any time without giving any reason and without affecting my benefits.

I agree not to restrict the use of any data or results that arise from the study.

I agree to undergo the necessary investigation which is part of the study.

Name of the participant :

Signature / thumb impression :

Investigator :

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
1	69417	Kumar	37	M	0	19.4	0	0	0	0	320	21	11	4.4	N/A	N/A	0	N/A
2	67386	Devadhathan	65	M	0	20.8	0	0	0	0	250	21	13	4.3	N/A	N/A	0	N/A
3	95377	Malliga	60	F	0	24.3	0	0	0	0	270	28	19	4.4	N/A	N/A	0	N/A
4	71570	Chitradevi	60	F	0	24.2	0	0	0	0	390	24	22	4.8	N/A	N/A	0	N/A
5	83774	Ali	63	M	0	25.39	0	0	0	0	230	22	39	4.7	N/A	N/A	0	N/A
6	98173	Shanthakumari	45	F	0	29.2	1	1	1	1	330	15	14	4.6	N/A	N/A	0	N/A
7	83980	Annalakshmi	35	F	1	38.8	1	0	1	1	280	18	21	4.9	N/A	N/A	0	N/A
8	98873	Saraswathi	50	F	0	25.1	0	0	0	0	250	29	39	4.9	N/A	N/A	0	N/A
9	328	Vijayalakshmi	57	F	0	24.8	0	0	0	0	190	24	22	4.3	-0.333	I	1	N/A
10	48969	Malliga	57	F	0	24.7	0	0	0	0	270	23	24	4.6	-1.711	L	1	N/A
11	78402	Ali	47	M	0	19	0	0	0	0	260	19	17	4.7	N/A	N/A	0	N/A
12	87032	Selvammal	53	F	0	29.3	1	1	1	1	300	15	17	4.6	-1.892	L	1	N/A
13	80114	Malarvizhli	41	F	0	29.9	1	1	1	1	300	18	26	4.9	N/A	N/A	0	N/A
14	52067	Rani	44	F	1	35.1	1	0	1	1	300	33	66	4.8	N/A	N/A	0	N/A
15	85655	Sivagami	57	F	1	30.66	1	0	0	0	350	24	34	4.7	N/A	N/A	0	N/A
16	98856	Lakshmi	41	F	0	27.6	1	1	1	1	300	24	22	5	N/A	N/A	0	N/A
17	75046	Logambal	38	F	0	23.5	0	0	0	0	170	22	26	4.8	N/A	N/A	0	N/A
18	23256	Kanagavalli	54	F	0	26.6	1	1	0	1	320	16	19	4.8	-2.5	L	2	N/A
19	2090	Noorjahan	50	F	0	24.6	0	0	0	0	500	19	10	4.5	N/A	N/A	0	N/A
20	101909	Guna	42	M	0	26.9	1	0	0	0	300	15	31	4.6	-2.5	L	1	N/A
21	90931	Kala	50	F	0	28.1	1	1	1	1	370	19	32	4.3	-2.5	L	2	N/A
22	50421	Abdul nazar	50	M	0	27.6	1	0	0	0	270	16	19	4.7	-1.879	L	1	N/A
23	73061	Lakshmi	65	F	0	21.2	0	0	0	0	370	13	20	4.8	-2.5	L	2	N/A
24	97301	Mani	55	M	0	21.6	0	0	0	0	110	18	15	4.5	N/A	N/A	0	N/A
25	94593	Tahira	52	F	0	25.7	0	0	0	0	320	16	18	4.8	N/A	N/A	0	N/A
26	72309	Meenatchi	29	F	0	18	0	0	0	0	190	10	19	4.4	N/A	N/A	0	N/A
27	69063	Solaiyamma	45	F	0	28.9	1	1	1	1	320	17	15	4.3	-2.03	L	2	N/A
28	71958	Ashok kumar	44	M	0	23.8	0	0	0	0	260	21	19	4.5	N/A	N/A	0	N/A
29	84419	Jothi	45	F	0	21.9	0	0	0	0	240	26	32	4.8	N/A	N/A	0	N/A
30	83764	Rahimunisha	55	F	1	31.5	1	1	1	1	300	42	54	4.8	-1.847	L	1	N/A
31	5117	Kuppamma	55	F	1	34.1	1	1	1	1	260	18	13	4.6	-0.35	I	2	ND
32	92840	Usharani	52	F	1	35.4	1	1	1	1	180	20	17	4.8	0.363	I	2	8.8
33	37213	Krishnaveni	55	F	0	28.8	1	1	1	1	220	24	22	4.2	0.355	I	1	N/A
34	75194	Josemin	65	F	1	30.1	1	1	1	1	240	48	58	4.6	-0.647	I	2	ND
35	94472	Kothainayagi	59	F	0	24	0	0	0	0	340	17	20	4.5	-2.5	L	1	N/A
36	74622	Radha	40	F	0	24.4	0	0	0	0	350	40	79	4.3	N/A	N/A	0	N/A
37	79360	Ellammal	58	F	0	29.3	1	1	1	1	390	24	23	4.8	-2.5	L	2	N/A
38	5533	Vasantha	62	F	0	21.1	0	0	0	0	390	20	15	4.6	N/A	N/A	0	N/A
39	26074	Krishnaveni	50	F	0	28.7	1	1	1	1	320	18	22	4.2	-2.119	L	1	N/A
40	88687	Prema	55	F	0	23.6	0	0	0	0	350	17	16	4	N/A	N/A	0	N/A
41	869/13	Ramesh	35	M	0	27.9	1	0	0	0	157	42	72	4.7	-1.193	I	1	N/A
42	50588	Nagabooshnam	60	F	1	33.3	1	1	1	1	400	34	15	5.1	-1.517	L	2	N/A
43	71457	Sairabanu	52	F	0	23.5	0	0	0	0	280	27	30	5	N/A	N/A	0	N/A
44	94592	Komalam	52	F	0	22.7	0	0	0	0	240	64	52	5	N/A	N/A	0	N/A
45	2860	Umawathi	53	F	1	36.1	1	1	1	1	370	35	24	4.9	-1.791	L	2	N/A
46	91722	Ramaiah	65	M	0	25.4	0	0	0	0	230	27	19	3.9	0.09	I	1	N/A
47	81260	Raju	56	M	0	28.7	1	1	0	1	250	23	21	3.4	-0.185	I	1	N/A
48	81856	Nirmala	45	F	1	38.7	1	1	1	1	350	21	27	3.2	-1.134	I	3	12.3
49	85927	Rejina	46	F	0	26.9	1	1	0	1	240	28	21	3.6	-0.49	I	2	ND
50	66605	Kokila	52	F	1	30.2	1	1	1	1	360	29	24	4.2	-2.038	L	2	N/A
51	73871	Malliga	48	F	0	22.9	0	0	0	0	270	31	28	4.6	N/A	N/A	0	N/A
52	98176	Kasturi	49	F	0	20.1	0	0	0	0	340	18	19	3.8	N/A	N/A	0	N/A
53	40683	Saroja	50	F	0	23.1	0	0	0	0	370	25	21	4.1	N/A	N/A	0	N/A
54	102326	Lakshmi	50	F	1	40.5	1	1	1	1	280	23	25	3.8	-0.125	I	3	9.1
55	2361	Kasturi	55	F	0	21.6	0	0	0	0	260	25	23	3.6	N/A	N/A	0	N/A
56	4617	Gunaselvi	46	F	0	27.1	1	0	1	1	70	21	18	4.6	0.913	H	1	N/A
57	6821/07	Meena	64	F	0	23.5	0	0	0	0	160	30	18	5.2	0.17	I	1	N/A
58	2684	Ramasamy	50	M	1	33.3	1	1	1	1	230	22	18	4.3	-0.183	I	2	9.1
59	1226	Rukmani	67	F	0	26.9	1	0	0	0	100	31	27	4.2	N/A	N/A	0	N/A
60	2655	Sivagami	38	F	0	24.97	0	0	0	0	140	57	69	3	0.226	I	1	N/A
61	34901	Chellam	52	F	1	36.36	1	1	1	1	210	30	18	4.4	0.813	H	1	N/A
62	12698	Vijaya	48	F	0	19.84	1	0	0	0	180	22	19	4.6	-1.134	L	1	N/A
63	38816	Muthumani	56	F	1	38.57	1	1	1	1	200	22	18	4	1.123	H	2	9.1
64	36190	Kunjara	60	F	0	23.37	1	0	0	0	180	35	21	4.1	N/A	N/A	0	N/A
65	2445	Madhiyalagan	49	M	0	26.26	1	1	0	1	280	23	18	4.6	-1.675	L	2	N/A
66	7643	Isabel	37	F	0	24.89	1	0	0	0	300	21	18	4.2	N/A	N/A	0	N/A
67	13664	Mala	50	F	1	32.27	1	1	1	1	250	40	28	2.4	0.919	H	3	6.8
68	21445	Nayagam	60	F	0	25.97	1	0	0	0	260	31	19	4.4	N/A	N/A	0	N/A
69	2436	Lakshmi	52	F	0	21.36	1	0	0	0	160	21	15	3.9	N/A	N/A	0	N/A
70	1837	Sarada	50	F	0	23.78	1	0	0	0	250	31	22	4.6	N/A	N/A	0	N/A
71	7250	Kathija	40	F	0	26.3	1	0	0	0	300	24	15	3.8	N/A	N/A	0	N/A
72	5465	Ponnamma	52	F	0	26.67	1	0	0	0	250	31	22	5.7	-1.731	L	1	N/A
73	6693	Radhakrishnan	72	M	0	26.08	1	1	0	1	150	32	25	3.9	1.314	H	2	ND
74	2178	Kalavathi	45	F	0	23.07	1	1	0	1	260	28	17	3.7	-0.903	I	2	ND

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
75	1124	Vasantha	49	F	0	22.83	1	0	0	0	190	28	31	4.4	N/A	N/A	0	N/A
76	3478	Sampoornam	60	F	0	26.35	1	1	0	1	100	28	15	5.2	1.268	H	2	8.8
77	17765	Chandra	53	F	0	24.46	1	0	0	0	210	31	15	4.6	-0.005	I	1	N/A
78	14465	Susila	65	F	0	24.44	1	0	0	0	120	28	17	5.2	0.796	H	1	N/A
79	92302	Ponnammal	70	F	0	22.35	1	0	0	0	260	63	45	3.4	N/A	N/A	0	N/A
80	4452	Muniyamma	68	F	0	23.11	1	0	0	0	140	24	18	4.5	N/A	N/A	0	N/A
81	7296	Alli	45	F	0	26.64	1	0	0	0	180	21	28	3.5	-0.283	I	1	N/A
82	63446	Dinakaran	32	M	0	29.62	1	1	1	1	160	18	15	3.9	-0.043	I	3	10.2
83	68426	Malligeshwari	56	F	1	34.96	1	1	1	1	180	21	25	3.1	1.259	H	3	12.7
84	73244	Kumar	28	M	0	22.04	0	0	0	0	200	18	15	4.4	-1.753	L	2	N/A
85	92028	Kanniyappan	55	M	0	27.06	1	1	1	1	190	24	32	3.6	N/A	N/A	0	N/A
86	203814	Lakshmi	70	F	0	20.41	0	0	0	0	160	14	18	4.5	N/A	N/A	0	N/A
87	7784	Peter	40	M	0	25.71	1	0	0	0	120	26	21	3.7	0.575	I	1	N/A
88	67600	Pangujam	55	F	0	25.71	1	0	0	0	200	25	29	4.8	-1.008	I	1	N/A
89	293244	Lakshmi	51	F	0	26.84	1	0	0	0	140	19	16	3.5	N/A	N/A	0	N/A
90	41223	Selvi	52	F	0	18.97	0	0	0	0	210	24	21	4.5	N/A	N/A	0	N/A
91	68343	Satyanarayana	72	M	0	22.68	1	0	0	0	180	21	20	3.8	N/A	N/A	0	N/A
92	68342	shyamalabai	66	F	0	29.96	1	1	1	1	220	42	34	4.4	N/A	N/A	0	N/A
93	99662	Sulekabeevi	63	F	0	24.84	1	0	0	0	240	38	29	4	-0.342	I	1	N/A
94	71198	Joycee	55	F	0	26.16	1	1	0	1	160	25	19	3	1.192	H	2	ND
95	63737	Manna	70	F	0	19.02	1	0	0	0	260	21	29	3.2	N/A	N/A	0	N/A
96	87108	Saathayee	65	F	0	28.06	1	1	1	1	250	20	25	3.8	-0.468	I	3	8.6
97	102128	Prema	55	F	0	25.39	1	0	0	0	150	22	19	4.2	0.301	I	1	N/A
98	1776	Sheela	48	F	1	33.33	1	1	1	1	240	18	15	3.4	0.188	I	2	7.5
99	68460	Zaithoonbeevi	54	F	1	32.44	1	1	1	1	180	19	15	3.8	0.908	H	2	ND
100	3498	Umadevi	47	F	0	23.5	1	0	0	0	180	29	25	3.8	N/A	N/A	0	N/A
101	94592	Komala	55	F	0	23.31	1	0	0	0	180	18	15	4.4	N/A	N/A	0	N/A
102	73213	Ramjaanbeevi	66	F	1	32.89	1	1	1	1	300	29	19	3.5	0.29	I	1	N/A
103	96480	Palani	48	M	0	22.38	0	0	0	0	400	49	18	3.7	N/A	N/A	0	N/A
104	3342	Manniyamma	61	F	0	28.94	0	0	1	0	240	43	32	4.6	-0.393	I	1	N/A
105	77580	Gandhimathi	65	F	0	27.06	1	1	1	1	180	38	25	3.8	N/A	N/A	0	N/A
106	2035	Alagamma	65	F	0	28.76	1	1	1	1	200	37	29	4.6	0.191	I	3	11.7
107	96318	Nagarathinam	52	F	0	24	0	0	0	0	200	39	26	3.2	0.408	I	3	10.4
108	74286	Andal	65	F	0	27.06	1	1	0	1	160	49	30	4.5	0.971	H	3	6.3
109	501823	Nagammal	50	F	0	25.81	1	0	0	0	220	28	20	3.6	N/A	N/A	0	N/A
110	93955	Vimala	55	F	0	25.68	1	0	0	0	160	32	28	4.1	0.249	I	1	N/A
111	103606	Mehabulbeevi	55	F	0	27.39	1	0	1	1	190	19	16	3.4	0.526	I	1	N/A
112	89393	Vijayalakshmi	65	F	0	23.78	0	0	0	0	200	22	17	4.5	-0.194	I	2	ND
113	103795	Alamelu	50	F	0	26.95	1	1	0	1	180	28	26	4.5	-0.406	I	3	8.7
114	6875	Sathya	60	F	0	24.73	1	0	0	0	190	39	26	3.5	N/A	N/A	0	N/A
115	91602	Kasturi	53	F	0	19.91	0	0	0	0	260	32	24	4.5	-0.1742	L	1	N/A
116	82176	Gracy	65	F	0	25.21	1	0	0	0	200	38	28	3.7	0.531	I	1	N/A
117	5770	Zahidabeevi	52	F	1	36.74	1	1	1	1	180	26	22	3.9	1.089	H	2	10.7
118	51005	Subatra	67	F	0	22.37	1	1	0	1	200	42	29	3.8	0.363	I	2	6.3
119	3117	Susila	61	F	0	28.54	1	1	1	1	220	21	19	4.8	N/A	N/A	0	N/A
120	64221	Rajakumari	60	F	0	28.13	1	1	1	1	200	29	19	4	N/A	N/A	0	N/A
121	74306	Yamuna	48	F	0	29.67	1	1	1	1	180	34	2	3.9	0.401	I	2	6.8
122	103245	Ravichandran	50	M	0	25.77	1	1	1	1	240	26	22	3.5	-0.533	I	2	ND
123	6861	Thomas	48	M	0	19.1	0	0	0	0	260	29	19	4.6	N/A	N/A	0	N/A
124	1880	Dhanalakshmi	32	F	1	32.37	1	1	1	1	280	30	24	3	-0.701	I	2	7.8
125	98653	Deivarani	46	F	0	22.6	1	0	0	0	190	36	24	4.2	-0.476	I	1	N/A
126	71640	Navamani	55	F	0	25.1	1	0	0	0	260	40	25	3.5	N/A	N/A	0	N/A
127	3766	Babyvasanthi	52	F	1	31.63	1	1	1	1	120	46	35	3.6	1.717	H	2	11.3
128	89533	Baby	70	F	0	26.3	1	1	0	1	120	35	28	4.6	1.159	H	2	ND
129	64443	Dhanalakshmi	45	F	0	20.54	0	0	0	0	140	46	23	3.2	1.099	H	1	N/A
130	3530	Tamilselvi	42	F	1	34.72	1	0	1	1	120	33	26	4.5	N/A	N/A	0	N/A
131	3298	Prema	61	F	0	25.97	1	0	0	0	150	39	24	3.2	1.7	H	1	N/A
132	66723	Santoshiyammal	45	F	0	26.16	1	0	0	0	120	24	22	3.8	N/A	N/A	0	N/A
133	72068	Senbagavalli	57	F	0	29.55	1	1	1	1	130	29	26	4.8	0.588	I	1	N/A
134	38735	Rukmani	53	F	0	22.22	0	0	0	0	180	35	28	4.8	N/A	N/A	0	N/A
135	40720	Rani	53	F	0	17.86	0	0	0	0	180	32	25	3.1	N/A	N/A	0	N/A
136	3990	Muthamma	65	F	0	26.16	1	0	0	0	140	26	22	3.7	N/A	N/A	0	N/A
137	5858	Kanniyammal	48	F	1	30.3	1	1	1	1	160	48	26	3.4	1.583	H	2	9.1
138	103134	Velsamy	52	M	0	27.64	1	1	1	1	220	28	24	3.4	N/A	N/A	0	N/A
139	90337	Saroja	45	F	0	27.7	1	1	0	1	120	34	22	4.5	0.724	H	2	12.8
140	69825	Samuelantony	72	M	0	21.99	1	0	0	0	130	35	26	3.4	1.585	H	1	N/A
141	55556	Manoharan	43	M	0	23.88	1	1	0	1	150	45	38	4.1	-0.193	I	2	5.4
142	89289	Rangasamy	67	M	0	28.25	1	1	1	1	160	21	19	4.1	0.898	H	2	ND
143	54426	Mehaboobeevi	55	F	1	30.41	1	1	1	1	120	62	40	3.9	1.749	H	2	11.7
144	7152	Murugammal	63	F	0	28.04	1	1	1	1	130	58	26	4.6	1.904	H	1	N/A
145	186	Baby	60	F	0	26.25	1	0	0	0	140	81	67	5.9	-0.375	I	1	N/A
146	80938	Jegadeeshwari	50	F	1	33.29	1	1	1	1	140	26	22	4.5	0.814	H	2	9.5
147	85836	Muthulakshmi	57	F	0	27.03	1	1	0	1	130	30	29	4.5	0.469	I	2	7.5
148	950	Revathy	51	F	0	23.81	0	0	0	0	130	58	32	3.5	N/A	N/A	0	N/A

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
149	4900	Selvi	32	F	0	25.57	1	1	0	1	140	62	45	3.5	0.277	I	3	5.8
150	66979	Amsaveni	65	F	1	31.83	1	0	0	0	120	38	24	3.9	N/A	N/A	0	N/A
151	102622	Tamaraiselvi	47	F	0	24.2	0	0	0	0	200	21	17	4	-0.548	I	2	5.3
152	41641	Susila	53	F	0	26.84	1	0	0	0	300	38	20	4	-0.72	I	1	N/A
153	2412	Jothi	42	F	1	30.43	1	1	1	1	260	31	23	3.3	-0.354	I	2	ND
154	64192	Shivaleela	68	F	0	23.19	0	0	0	0	200	19	16	4.2	-0.046	I	1	N/A
155	3507	Ravichandran	41	M	0	21.77	0	0	0	0	160	18	13	2.9	0.395	I	1	N/A
156	5600	Madhavan	40	M	0	22.6	0	0	0	0	180	31	22	3.5	-0.196	I	1	N/A
157	85855	Joharabeevi	72	F	1	31.01	1	1	1	1	200	41	32	3.8	1.194	H	2	ND
158	1816	Durga	26	F	0	28.93	1	1	1	1	160	27	16	4.4	-0.177	I	1	N/A
159	91374	Manickam	62	M	0	21.45	0	0	0	0	210	46	31	3.7	0.062	I	2	4.2
160	104526	Pushpa	31	F	0	28.04	1	1	1	1	160	22	15	3.3	0.432	I	1	N/A
161	93985	Sahul hameed	55	M	1	31.64	1	1	1	1	210	16	22	3	0.474	I	2	4.5
162	200922	Saradamma	70	F	0	25.21	1	1	0	1	210	26	17	3.4	0.955	H	2	ND
163	3932	Jeevarathinam	70	F	0	20.4	1	0	0	0	240	23	18	3.7	N/A	N/A	0	N/A
164	84550	Jamunabegam	63	F	0	26.99	1	1	0	1	200	35	26	4.2	0.284	I	2	5.4
165	27513	Subramani	63	M	0	21.72	0	0	0	0	100	15	17	3.6	1.025	H	1	N/A
166	3841	Kamala	49	F	0	27.59	1	1	1	1	280	19	16	3.4	N/A	N/A	0	N/A
167	95293	Meenatchi	50	F	0	27.89	1	0	1	1	180	21	16	3.3	0.708	H	1	N/A
168	8081	Jamuna	38	F	0	25.45	1	0	0	0	250	25	19	3.7	N/A	N/A	0	N/A
169	21527	Shanmugathai	58	F	0	25.44	1	0	0	0	240	22	17	3.5	-0.156	I	1	N/A
170	103411	Indrani	40	F	1	43.35	1	1	1	1	160	38	29	4	1.587	H	2	8.1
171	2244	Ramayeeamma	70	F	0	26.16	1	0	0	0	210	22	17	3.8	N/A	N/A	0	N/A
172	91468	Lilly	50	F	0	28.76	1	1	1	1	200	33	16	4.7	0.348	I	1	N/A
173	68579	Mumtajbegam	30	F	0	24.67	0	0	0	0	250	25	18	3.6	N/A	N/A	0	N/A
174	3301	Karpagam	44	F	1	35.21	1	1	1	1	210	19	17	2.9	0.855	H	3	13.8
175	82684	Bhavani	46	F	1	35.67	1	1	1	1	180	25	17	3.3	1.448	H	2	10.7
176	2976	Kanagalakshmi	40	F	1	43.11	1	1	1	1	250	51	32	4.1	0.609	I	2	6.3
177	6023	Rani	43	F	0	26.16	1	0	0	0	200	32	19	4	N/A	N/A	0	N/A
178	53244	Sankaramma	60	F	0	26.4	1	0	0	0	200	45	26	4.1	0.564	I	1	N/A
179	99321	Madhivanan	44	M	0	26.03	0	0	0	0	250	45	30	4.2	-1.007	I	1	N/A
180	6681	Alagiyaperumal	74	M	0	27.99	0	0	0	0	190	59	32	4.8	1.011	H	1	N/A
181	5537	Ponnamma	57	F	0	22.68	0	0	0	0	280	36	15	4.1	N/A	N/A	0	N/A
182	6361	Shanthi	45	F	0	29.48	1	1	1	1	280	52	30	4.6	-1.069	I	1	N/A
183	6362	Shanmugam	62	M	0	25.04	1	0	0	0	250	48	31	4.9	N/A	N/A	0	N/A
184	2911	Vasantha	53	F	0	28.19	1	1	1	1	200	28	32	3.9	N/A	N/A	0	N/A
185	32781	Gajalakshmi	59	F	1	31.11	1	1	1	1	160	46	21	4	2	H	2	12.3
186	14980	Dhanam	53	F	0	18.73	0	0	0	0	210	32	24	3.8	N/A	N/A	0	N/A
187	3968	Panjali	53	F	1	32.89	1	1	1	1	120	46	21	4	2	H	2	9.3
188	23980	Prema	50	F	0	28.72	1	1	1	1	250	32	19	3.6	N/A	N/A	0	N/A
189	45876	Pichumani	65	F	0	27.34	1	0	1	1	180	52	30	3.1	1.76	H	1	N/A
190	52178	Yasodha	50	F	0	27.03	1	1	0	1	180	48	31	4	0.399	I	2	7.4
191	66415	Nagamma	70	F	0	24.97	1	1	0	1	190	62	30	3.9	1.394	H	2	5
192	38021	Mohana	65	F	0	26.9	1	1	0	1	120	41	30	3.5	1.872	H	2	ND
193	4587	Ansari	37	M	0	27.92	1	0	0	0	200	32	24	3.3	-0.01	I	1	N/A
194	81754	Fathima	44	F	1	31.39	1	1	1	1	150	46	30	3.2	1.49	H	2	8.6
195	72608	Susila	55	F	0	22.68	0	0	0	0	160	32	21	3	1.07	H	1	N/A
196	70281	Rahima	47	F	1	30.96	1	1	1	1	200	42	26	3.1	1.057	H	2	5.3
197	86331	Lakshmi	53	F	0	28.13	1	1	1	1	210	39	22	3.6	0.709	H	2	ND
198	587	Zelumbeevi	64	F	1	33.76	1	1	1	1	180	46	30	3	2	H	3	6.7
199	74900	Malathi	48	F	0	28.15	1	1	1	1	210	45	31	4.1	-0.122	I	2	6.8
200	71863	Seniyamma	45	F	0	27.66	1	1	0	1	180	32	15	3.1	1.416	H	2	7.7
201	68765	Sulochana	50	F	0	23.07	1	0	0	0	280	41	22	3.3	N/A	N/A	0	N/A
202	232	Rashidhabegum	55	F	0	23.5	1	0	0	0	180	41	28	3.2	0.697	H	1	N/A
203	1019	Kajamoideen	50	M	0	29.39	1	1	1	1	120	25	15	4.8	N/A	N/A	0	N/A
204	92376	Jamuna	55	F	0	29.15	1	1	1	1	200	22	20	4.6	-0.317	I	1	N/A
205	62413	Devi	53	F	1	31.22	1	1	1	1	180	34	26	4.7	0.203	I	3	9.2
206	6939	Mythili	58	F	0	21.45	1	0	0	0	160	49	70	5.1	N/A	N/A	0	N/A
207	89434	Vasanthi	44	F	0	26.04	1	1	0	1	160	49	41	5	-0.666	I	2	ND
208	91640	Roopavathy	60	F	0	26.67	1	0	0	0	260	24	13	4.7	-0.472	I	1	N/A
209	3903	Thangam	65	F	0	29.52	1	1	1	1	160	25	18	4.1	1.224	H	2	ND
210	81785	Selvamary	41	F	0	29.14	1	1	1	1	160	25	15	3.9	0.707	H	2	ND
211	3617	Lakshmi	55	F	0	23.11	1	0	0	0	180	18	18	4.5	N/A	N/A	0	N/A
212	3279	Paramasivam	59	M	0	16.65	0	0	0	0	200	26	11	5	N/A	N/A	0	N/A
213	90975	Mangalakshmi	60	F	0	25.3	1	1	0	1	160	48	18	4.1	1.907	H	2	ND
214	70569	Subramani	58	M	0	28.6	1	1	1	1	150	31	26	5.2	0.088	I	2	7.8
215	272	Chandra	38	F	0	20.69	0	0	0	0	180	24	9	4.9	N/A	N/A	0	N/A
216	6709	Thangakani	65	F	0	23.31	1	0	0	0	200	44	41	5.1	-0.852	I	1	N/A
217	74806	Devaraj	58	M	1	30.86	1	1	0	1	220	29	25	4.8	-0.378	I	1	N/A
218	8069	Gurusamy	75	M	0	23.38	1	1	0	1	200	30	10	4.3	1.96	H	2	ND
219	52437	Thilagavathy	62	F	1	31.39	1	1	1	1	160	34	24	4.6	0.986	H	2	ND
220	94977	Thomas	74	M	0	26.71	1	1	0	1	160	33	15	4.6	1.766	H	2	ND
221	104937	Fathima	50	F	1	31.62	1	1	1	1	160	110	176	4.5	-0.154	I	2	ND
222	6719	Kovilpillai	64	F	1	32.41	1	1	1	1	215	36	44	4.5	-0.085	I	1	N/A

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
223	74033	Shanthi	47	F	1	34.24	1	1	1	1	300	31	20	4.8	-1.121	I	3	6.9
224	6145	Vatchala	53	F	0	25.92	1	0	0	0	160	62	52	5.1	-0.413	I	1	N/A
225	99450	Vimala	45	F	1	36.74	1	1	1	1	200	47	36	4.7	0.164	I	1	N/A
226	61088	Selvi	48	F	0	28.89	1	1	1	1	170	43	20	3.6	N/A	N/A	0	N/A
227	25978	Sundaraj	63	M	0	23.94	1	1	0	1	115	25	22	5.2	0.234	I	2	9.3
228	53889	Vasantha	57	F	1	31.04	1	1	1	1	160	23	9	4.6	1.896	H	2	ND
229	66821	Puspha	54	F	0	26.84	1	1	0	1	200	42	15	5.1	0.782	H	2	12.3
230	98051	Murugesan	43	M	0	22.59	1	0	0	0	300	29	18	4.8	N/A	N/A	0	N/A
231	64991	Amsa	55	F	0	26.14	1	1	0	1	120	35	17	4.7	1.323	H	2	8.6
232	49025	Noorjahan	67	F	0	27.63	1	0	1	1	140	55	21	5.2	1.872	H	1	N/A
233	92646	Najmulbeevi	50	F	0	26.17	1	0	0	0	160	26	16	5.4	N/A	N/A	0	N/A
234	42255	Jagadeesan	50	M	1	30.45	1	1	1	1	200	25	19	4.7	-0.232	I	2	ND
235	10816	Suriyakumari	65	F	0	25.78	0	0	0	0	200	76	23	5.5	N/A	N/A	0	N/A
236	102500	Suguna	35	F	0	26.67	1	0	0	0	240	18	37	5.2	-2.5	L	1	N/A
237	1118	Devaki	43	F	1	33.29	1	0	1	1	320	19	16	4.5	N/A	N/A	0	N/A
238	1516	Ellammal	63	F	0	28	1	1	1	1	240	27	13	4.8	N/A	N/A	0	N/A
239	15438	Kamala	64	F	0	25.78	1	0	0	0	260	25	14	4.7	-0.468	I	1	N/A
240	16790	Malliga	60	F	0	26.53	0	0	0	0	300	29	15	5.3	-1.315	I	1	N/A
241	1389	Saritha	34	F	0	24.78	1	1	0	1	260	17	15	4.8	-2.384	L	2	N/A
242	81507	Rajeshwari	48	F	1	31.12	1	0	0	0	320	22	15	4.7	N/A	N/A	0	N/A
243	67115	Chinrajpillai	71	M	0	26.16	1	0	0	0	180	33	16	4.8	N/A	N/A	0	N/A
244	51151	Vellachi	60	F	0	27.27	1	1	1	1	260	31	16	4.4	N/A	N/A	0	N/A
245	5762	Muniyamma	60	F	0	26.02	0	0	0	0	180	48	19	4.6	1.246	H	3	13.8
246	68723	Rohini	47	F	0	27.89	1	1	0	1	120	27	12	4.9	1.249	H	2	ND
247	21034	Saroja	43	F	0	28.13	1	1	1	1	200	17	9	4.7	-0.142	I	1	N/A
248	70809	Chinnaraj	47	M	0	29.43	0	1	1	0	230	29	13	4.9	N/A	N/A	0	N/A
249	3801	Nageshwaran	55	M	0	27.61	0	0	0	0	130	55	23	5.2	1.331	H	1	N/A
250	100609	Vasantha	50	F	0	28.53	1	1	1	1	240	33	18	5.1	N/A	N/A	0	N/A
251	9414	Lakshmi	60	F	0	29.76	1	1	1	1	200	25	16	5.1	N/A	N/A	0	N/A
252	100584	Umarani	60	F	0	26.63	1	0	0	0	180	22	15	4.6	0.254	I	1	N/A
253	76210	Shanthi	45	F	0	27.56	1	0	1	1	200	27	15	5	-0.407	I	1	N/A
254	1073	Govindasamy	66	M	1	32.27	1	1	1	1	200	43	18	4.7	1.593	H	2	ND
255	79136	Mariyammal	65	F	0	27.68	1	1	0	1	250	33	15	3.8	0.882	H	2	ND
256	25268	Parasakthi	43	F	1	31.11	1	1	1	1	210	55	22	4.4	0.811	H	2	6.8
257	50099	Kasiammal	65	F	0	22.67	1	0	0	0	260	38	17	4.7	-0.278	I	1	N/A
258	73161	Umavathy	54	F	0	22.83	1	0	0	0	240	63	41	4.8	N/A	N/A	0	N/A
259	71192	Fathimabeevi	55	F	0	25.15	1	0	0	0	190	51	37	4	0.109	I	1	N/A
260	93885	Badrunisha	45	F	1	40.57	1	1	1	1	200	30	19	3.6	1.521	H	3	12.3
261	2963	Mariambeevi	45	F	0	26.67	1	0	0	0	220	25	11	4.4	N/A	N/A	0	N/A
262	68686	Indrani	49	F	0	29.67	1	1	1	1	210	37	22	3.1	N/A	N/A	0	N/A
263	42244	Neelavathi	47	F	1	30.13	1	1	1	1	120	68	35	5.1	1.024	H	2	ND
264	2404	Muthulakshmi	61	F	1	31.22	1	1	1	1	210	31	26	4.5	0.127	I	3	8.1
265	621	Saradammal	70	F	0	19.29	1	0	0	0	200	25	17	4.1	N/A	N/A	0	N/A
266	3867	Umerabaanu	47	F	0	22.58	1	1	0	1	190	83	51	4	-0.182	I	2	4.5
267	104077	Padmini	58	F	0	25.11	1	0	0	0	140	22	16	3.7	1.061	H	1	N/A
268	7397	Sudha	45	F	0	25.4	1	1	0	1	210	22	16	3.8	-0.369	I	2	ND
269	93209	Sundari	65	F	0	19.98	1	0	0	0	210	21	15	3.7	N/A	N/A	0	N/A
270	3014	Fathimabeevi	65	F	0	26.52	1	1	0	1	190	29	16	4.3	0.839	H	2	ND
271	6757	Deivasundari	33	F	1	30.41	1	1	1	1	200	35	21	4.2	-0.187	I	3	7.4
272	97233	Shanthi	42	F	0	26.06	1	0	0	0	210	42	29	3.9	N/A	N/A	0	N/A
273	53298	Ramani	42	F	1	32.03	1	1	1	1	190	25	15	3.4	0.956	H	2	ND
274	3417	Devakanni	61	F	1	30.33	1	1	1	1	210	55	19	4	2	H	2	ND
275	75872	Ramjaanbeevi	45	F	0	24.11	1	0	0	0	180	18	12	4.5	N/A	N/A	0	N/A
276	24314	Balamma	47	F	0	22.31	1	0	0	0	220	38	17	3.9	N/A	N/A	0	N/A
277	77858	Parvathy	50	F	0	25.4	1	0	0	0	160	21	15	3.6	N/A	N/A	0	N/A
278	32518	Sundari	60	F	1	31.39	1	0	0	0	190	29	18	4.3	N/A	N/A	0	N/A
279	83998	Murugan	39	M	0	21.93	1	0	0	0	200	46	21	4.1	N/A	N/A	0	N/A
280	73218	Narasaiah	63	M	0	25.08	1	1	0	1	160	32	15	4	1.536	H	2	ND
281	39556	Lakshmiammal	45	F	1	30.25	1	1	1	1	180	41	30	3.9	0.402	I	2	7.4
282	3430	Jeyalakshmi	65	F	1	34.24	1	1	1	1	160	28	15	3.5	2	H	2	10.7
283	83045	Parvathy	67	F	0	24.03	1	1	0	1	200	41	30	3.3	0.768	H	2	ND
284	27337	Kasimeena	52	F	0	28.13	1	1	1	1	200	41	28	3.2	0.761	H	2	6.8
285	6192	Neelamegam	44	M	0	22.05	1	0	0	0	200	48	22	3.6	N/A	N/A	0	N/A
286	89551	Musthaan	65	F	0	28.3	1	1	1	1	260	51	30	3	0.843	H	3	8.4
287	80805	Banumathi	48	F	0	22.67	0	0	0	0	300	28	18	3.2	N/A	N/A	0	N/A
288	3075	Samsubeevi	58	F	0	24.97	1	0	0	0	300	40	21	3.3	N/A	N/A	0	N/A
289	63720	Prema	48	F	0	24.24	1	1	0	1	160	30	15	3.9	0.836	H	2	ND
290	70192	Gurudevi	46	F	0	27.39	1	1	0	1	180	41	28	3.1	0.795	H	2	ND
291	83380	Gnanammal	65	F	0	24.89	1	1	0	1	320	32	26	3.2	-0.854	I	3	7.8
292	87225	Rani	54	F	0	28.13	1	1	1	1	260	32	15	3.4	N/A	N/A	0	N/A
293	87968	Srinivasan	67	M	0	25.61	1	0	0	0	180	31	22	3.8	N/A	N/A	0	N/A
294	1567	Kantha	56	F	1	31.96	1	1	1	1	180	33	16	3.4	1.989	H	3	8.4
295	48375	Eswaran	59	M	1	30.06	1	1	1	1	200	42	20	3.2	1.831	H	3	9.1
296	6705	Bujjammaal	65	F	0	20	0	0	0	0	180	36	21	3.1	N/A	N/A	0	N/A

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
297	3260	Amsa	60	F	1	30.13	1	0	0	0	180	41	28	3	N/A	N/A	0	N/A
298	6788	Ramamoorthy	39	M	1	32.08	1	1	0	1	200	41	30	3.2	0.555	I	1	N/A
299	98366	Sampathkumar	59	M	0	28.72	1	1	1	1	200	38	21	3.2	1.417	H	3	6.7
300	6784	Lakshmi	50	F	0	28.06	1	1	1	1	160	48	31	3.2	1.284	H	1	N/A
301	3679	Kanaga	51	F	0	22.67	1	1	0	1	300	32	20	3	-0.823	I	2	ND
302	53776	Sundari	63	F	1	32.73	1	1	1	1	200	41	22	3.6	2	H	3	12.3
303	74918	Subhulakshmi	52	F	0	23.81	1	0	0	0	220	32	15	3.7	N/A	N/A	0	N/A
304	37854	Meharunisha	62	F	0	25.15	1	0	0	0	200	21	19	3.5	N/A	N/A	0	N/A
305	13686	Thangam	66	F	0	27.47	1	0	1	1	200	28	24	4.5	0.064	I	1	N/A
306	20123	Johnbeevi	50	F	0	25.81	1	0	0	0	210	45	28	4.5	N/A	N/A	0	N/A
307	6143	Marimuthu	39	M	0	25.04	0	0	0	0	250	54	32	3.8	N/A	N/A	0	N/A
308	95361	Anjalai	62	F	1	31.18	1	1	1	1	260	20	15	5	-0.68	I	2	ND
309	5723	Omana	62	F	1	33.3	1	1	1	1	280	28	15	3.6	0.711	H	2	7.7
310	4577	Selvam	51	M	0	22.86	0	0	0	0	240	19	14	4.4	N/A	N/A	0	N/A
311	6430	Arokiyam	64	M	0	27.68	1	1	1	1	180	42	38	3.6	0.803	H	2	ND
312	7082	Somasundaram	41	M	0	22.86	0	0	0	0	250	20	16	3.9	N/A	N/A	0	N/A
313	40939	Kasturi	62	F	0	26.16	1	0	0	0	210	38	25	4.6	-0.053	I	1	N/A
314	26328	Elizabeth	45	F	1	32	1	1	1	1	160	39	55	3.1	0.704	H	3	7.6
315	7916	Karunakaran	44	M	0	22.31	1	0	0	0	190	51	41	5	N/A	N/A	0	N/A
316	29301	Chellama	75	F	0	24.44	1	1	0	1	250	30	24	3.9	-0.059	I	2	ND
317	55101	Vasantha	40	F	0	23.95	1	0	0	0	280	19	16	3	N/A	N/A	0	N/A
318	9	Balasundaram	71	M	0	21.64	0	0	0	0	210	21	17	3.4	0.365	I	1	N/A
319	7642	Lakshminarayananan	38	F	0	23.51	1	0	0	0	200	16	12	3.4	N/A	N/A	0	N/A
320	3401	Kanchana	58	F	0	26.84	1	1	0	1	210	31	24	4.4	-0.231	I	2	ND
321	3092	Chandra	58	F	0	20.17	0	0	0	0	280	24	21	3.9	N/A	N/A	0	N/A
322	1869	Saraswathi	42	F	0	27.06	1	1	1	1	210	45	39	4.8	N/A	N/A	0	N/A
323	64008	Quraishabeevi	66	F	1	32.76	1	1	1	1	210	19	16	4	0.782	H	2	9.1
324	12	Dilshad	45	F	1	30.08	1	1	1	1	210	59	41	4.2	-0.13	I	2	8.8
325	103080	Vijaya	51	F	0	28.76	1	1	1	1	220	16	13	2.9	0.49	I	2	ND
326	103060	Lakshmi	50	F	0	22.96	1	0	0	0	180	26	22	3.7	N/A	N/A	0	N/A
327	1533	Shanmugakani	50	F	0	29.14	1	1	1	1	195	39	26	3.4	0.75	H	2	7.6
328	615	Parvathy	60	F	0	20.82	1	0	0	0	200	41	38	4.6	N/A	N/A	0	N/A
329	42406	Kathijabai	65	F	0	24.14	0	0	0	0	230	21	17	3.4	N/A	N/A	0	N/A
330	41613	Gunasekaran	59	M	0	22.76	0	0	0	0	180	24	21	4.5	N/A	N/A	0	N/A
331	83298	Vincent paul	63	M	0	20.96	0	0	0	0	200	38	24	3.5	0.414	I	1	N/A
332	85381	Maragadham	54	F	1	31.14	1	1	1	1	210	18	16	3.9	0.32	I	1	N/A
333	85382	Mariyamma	74	F	0	27.28	1	1	1	1	250	45	31	4.9	N/A	N/A	0	N/A
334	81670	Thenmozhi	41	F	1	36.44	1	1	1	1	260	54	42	3.5	-0.02	I	3	5.4
335	67815	Kaliappan	70	M	0	26.78	1	1	0	1	210	81	55	3	1.31	H	2	ND
336	71679	Govindammal	60	F	0	22.06	1	0	0	0	180	39	24	4.2	N/A	N/A	0	N/A
337	71722	Shanthi	63	F	0	23.74	0	0	0	0	190	29	24	3.4	N/A	N/A	0	N/A
338	92450	Uma	50	F	0	20.93	0	0	0	0	190	39	25	3.7	N/A	N/A	0	N/A
339	49642	Chaellammal	57	F	0	22.22	1	0	0	0	260	26	22	3.9	N/A	N/A	0	N/A
340	5918	Vannamma	51	F	1	30.3	1	1	1	1	180	21	19	3.1	0.898	H	2	ND
341	37	Govindasamy	70	M	0	18.42	0	0	0	0	180	40	26	4.2	N/A	N/A	0	N/A
342	1729	Vigneshwari	46	F	0	23.14	1	0	0	0	200	39	22	4.2	-0.285	I	1	N/A
343	2037	Kumar	47	M	0	25.71	1	0	0	0	200	26	21	3.1	N/A	N/A	0	N/A
344	93446	Lakshmi	72	F	0	25.11	1	0	0	0	180	29	21	3.9	N/A	N/A	0	N/A
345	51570	Kasturi	63	F	0	24.2	1	0	0	0	210	42	29	5.6	N/A	N/A	0	N/A
346	93022	Valarmathi	48	F	0	21.08	1	0	0	0	160	29	22	4.1	N/A	N/A	0	N/A
347	6778	Padmini	55	F	0	23.46	1	1	0	1	160	25	18	3.2	0.878	H	2	ND
348	1426	Valliamma	70	F	1	31.22	1	1	1	1	200	29	26	4.1	0.778	H	2	ND
349	81746	Mariambeevi	55	F	1	36.73	1	1	1	1	180	34	26	3.5	1.587	H	2	13.1
350	80134	Rasoolbeevi	43	F	0	29.14	1	1	1	1	210	21	19	2.9	0.235	I	1	N/A
351	3265	Neela	48	F	0	23.78	1	0	0	0	180	21	18	3.4	N/A	N/A	0	N/A
352	104418	Vasuki	45	F	0	22.64	1	0	0	0	200	39	22	3.1	N/A	N/A	0	N/A
353	85894	Subramani	73	M	0	21.91	0	0	0	0	210	21	15	3.4	0.628	H	2	7.4
354	63438	Shanmugam	56	M	0	23.03	1	1	1	1	190	49	20	4.5	0.677	H	3	7.7
355	95998	Arumugasamy	67	M	0	28.35	1	1	1	1	210	18	17	2.9	1.003	H	3	8.1
356	66282	Zerin bose	38	F	0	22.38	1	0	0	0	210	25	18	3.7	N/A	N/A	0	N/A
357	90624	Eswari	46	F	0	22.01	0	0	0	0	250	32	19	3.9	N/A	N/A	0	N/A
358	6721	Sivagami	35	F	1	31.96	1	1	1	1	190	49	22	4.9	0.255	I	2	ND
359	5417	Hyathnisha	41	F	1	34.63	1	1	1	1	160	19	16	5	0.023	I	2	5.3
360	88859	Lakshmi	60	F	0	24.45	1	0	0	0	200	23	21	3.2	N/A	N/A	0	N/A
361	26122	Malliga	48	F	0	20.03	1	0	0	0	200	19	14	4.6	N/A	N/A	0	N/A
362	4303	Ismail	59	M	0	22.31	0	0	0	0	210	33	29	4.6	-0.904	I	1	N/A
363	6116	Padmavathy	60	F	0	25.11	1	0	0	0	250	43	22	3.1	N/A	N/A	0	N/A
364	77742	Amirthavalli	60	F	0	22.49	1	0	0	0	180	58	39	3.4	0.677	H	1	N/A
365	82937	Santhanalakshmi	60	F	0	28.89	1	1	1	1	250	26	21	2.8	0.518	I	1	N/A
366	95417	Puspa	58	F	0	25.21	1	0	0	0	210	54	39	4.7	N/A	N/A	0	N/A
367	87799	Rameezabeevi	62	F	0	29	1	1	1	1	200	30	21	3	1.309	H	2	ND
368	97429	Karpagam	45	F	0	29.59	1	1	1	1	220	27	21	3.1	0.268	I	1	N/A
369	23198	Thamayandhi	46	F	0	24.65	1	1	0	1	210	36	28	4.5	-0.953	I	2	ND
370	91175	Annamalai	75	M	0	21.87	1	0	0	0	210	49	40	4.9	N/A	N/A	0	N/A

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
371	102273	Subramani	71	M	0	26.71	1	1	1	1	210	21	18	3.7	0.576	I	3	6.8
372	6008	Puspa	36	F	0	27.77	1	1	1	1	200	21	19	3.8	N/A	N/A	0	N/A
373	96908	Pargunan	37	M	0	27.99	1	1	1	1	180	55	32	3.8	N/A	N/A	0	N/A
374	88590	Sekar	49	M	0	18.34	0	0	0	0	210	55	29	3.8	N/A	N/A	0	N/A
375	70571	Yasodha	61	F	0	29.34	1	1	1	1	190	29	25	2.7	1.366	H	2	ND
376	82968	Selvi	52	F	0	24.03	1	0	0	0	170	51	38	4	0.117	I	1	N/A
377	55646	Kantha	60	F	1	32	1	1	1	1	250	44	28	3.6	0.613	I	1	N/A
378	32765	Farida	43	F	0	24.84	1	1	0	1	160	19	16	4.6	-0.559	I	2	5.3
379	70066	Sabiya	47	F	0	24.98	1	0	0	0	240	32	28	3.7	N/A	N/A	0	N/A
380	2149	Aseenabegum	40	F	1	30.13	1	1	1	1	200	25	16	4.1	0.008	I	2	ND
381	100276	Andal	55	F	0	23.14	1	0	0	0	140	33	21	3.8	N/A	N/A	0	N/A
382	102371	Sarada	42	F	1	30.48	1	1	1	1	160	40	25	4	0.738	H	2	10.4
383	55613	Sathaar	59	M	0	24.69	1	1	1	1	300	18	15	3.6	-1.129	I	3	5.3
384	79429	Gowsiya	52	F	0	27.83	1	1	0	1	150	27	18	3.9	0.956	H	2	7.7
385	4620	Saraswathi	52	F	1	30.92	1	1	1	1	200	25	16	3.9	0.658	I	2	ND
386	7420	Gajalakshmi	50	F	0	23.81	1	0	0	0	240	26	19	3.2	-0.334	I	1	N/A
387	66435	Prema	55	F	1	30.96	1	1	1	1	300	16	12	4.1	-0.886	I	1	N/A
388	91998	Leelavathy	66	F	1	30.08	1	1	1	1	180	28	16	3.5	1.807	H	1	N/A
389	88596	Raziyabegum	50	F	1	30.13	1	0	0	0	260	25	13	4.4	N/A	N/A	0	N/A
390	89107	Jaibunisha	60	F	0	29.08	1	1	1	1	140	38	17	3.6	2	H	2	ND
391	102137	Paramasivam	65	M	0	23.38	1	1	0	1	300	19	12	3.3	-0.453	I	2	6.5
392	68167	Lakshmi	58	F	1	31.96	1	1	1	1	260	15	19	3.6	-0.369	I	1	N/A
393	3410	Latha	40	F	0	23.73	1	0	0	0	360	37	19	3.5	N/A	N/A	0	N/A
394	7091	Vasanthi	53	F	0	25.63	1	0	0	0	240	41	31	3.8	-0.493	I	1	N/A
395	972	Govindammal	38	F	0	27.06	1	0	1	1	380	21	16	4.6	-2.5	L	1	N/A
396	98735	Manoranjidham	35	F	0	26.16	1	1	0	1	260	37	15	5.2	-1.161	I	2	ND
397	90135	Rose	47	F	0	23.44	1	0	0	0	160	22	13	4.5	N/A	N/A	0	N/A
398	6131	Senbagavalli	44	F	1	30.86	1	1	1	1	180	19	14	3.8	0.479	I	2	7.7
399	83255	Gowri	52	F	1	31.5	1	1	1	1	200	25	16	4.8	0.119	I	1	N/A
400	66366	Selvammal	64	F	0	23.5	1	0	0	0	300	25	17	3.9	-0.986	I	1	N/A
401	2931	Suchitra	35	F	0	25.15	1	0	0	0	180	42	31	4.2	-0.657	I	1	N/A
402	55	Vanitha	45	F	0	21	1	0	0	0	240	28	17	3.8	-0.903	I	1	N/A
403	63640	Rukmani	66	F	0	26.52	1	1	0	1	240	25	17	4.2	-0.046	I	2	ND
404	3095	Gnanasoundari	49	F	0	29.55	1	1	1	1	240	22	16	4.1	-0.419	I	2	ND
405	1265	Kannatha	50	F	0	24.26	1	0	0	0	300	25	18	3.7	-1.382	I	1	N/A
406	76846	Yasodha	60	F	0	24.89	1	1	0	1	260	18	13	3.8	-0.503	I	2	ND
407	2570	Kulandaiyamma	58	F	0	25.39	1	0	0	0	240	39	16	3.5	0.971	H	1	N/A
408	77431	Bowsiya	58	F	1	31.96	1	1	1	1	260	20	14	4.2	-0.132	I	2	6.5
409	210013	Anandhi	52	F	1	30.76	1	0	0	0	340	25	18	3.5	N/A	N/A	0	N/A
410	82400	Ponnamma	65	F	0	27.28	1	1	0	1	260	21	16	3.9	-0.23	I	2	ND
411	83018	Panneer	68	M	1	30.48	1	1	1	1	250	24	19	3.2	0.725	H	2	ND
412	3800	Murugavel	63	M	0	23.83	0	0	0	0	160	26	21	3.2	N/A	N/A	0	N/A
413	104453	Mariyappan	47	M	0	20.55	0	0	0	0	140	18	15	4.4	N/A	N/A	0	N/A
414	26708	Vasantha	67	F	0	24.44	1	1	0	1	110	22	19	3.6	1.572	H	2	9.1
415	92102	Rajasekar	51	M	1	31.02	1	1	1	1	160	19	14	4.4	0.617	I	2	ND
416	105191	Dhanalakshmi	37	F	0	22.51	1	0	0	0	180	32	29	3.1	N/A	N/A	0	N/A
417	48412	Seetha	60	F	0	27.77	1	1	0	1	140	46	34	3	1.825	H	2	ND
418	2177	Rameeza	43	F	0	26.52	1	0	0	0	200	39	28	3.1	0.272	I	1	N/A
419	194083	Hazira	73	F	0	25.43	1	0	0	0	180	58	31	4.4	1.155	H	1	N/A
420	51832	Majidha	65	F	0	24.44	1	0	0	0	100	29	20	2.9	N/A	N/A	0	N/A
421	101266	Krishnaveni	61	F	0	26.63	1	0	0	0	180	56	32	3.1	1.562	H	1	N/A
422	70368	Glory	38	F	1	37.18	1	1	1	1	300	40	19	3	0.56	I	2	7.7
423	67586	Isravel	66	M	0	22.58	1	0	0	0	280	49	26	3.6	-0.131	I	1	N/A
424	40492	Valliammal	40	F	0	22.31	1	0	0	0	200	19	17	3.4	N/A	N/A	0	N/A
425	64775	Rajathi	60	F	0	27.56	1	1	0	1	200	65	38	3.6	0.983	H	2	ND
426	8721	Kanthamma	70	F	0	26.16	1	1	0	1	160	19	15	3	1.698	H	2	ND
427	56	Balu	62	M	0	23.05	1	1	0	1	140	21	16	4	0.755	H	2	6.8
428	21980	Madhinabegum	65	F	1	31.22	1	1	1	1	100	29	24	3.4	2	H	2	ND
429	85078	Anjalakshmi	61	F	0	22.35	0	0	0	0	100	29	26	3.5	1.307	H	2	ND
430	39087	Angamma	60	F	0	24.24	1	1	0	1	160	42	39	4.5	-0.03	I	2	ND
431	101719	Shanthi	50	F	1	33.33	1	0	1	1	200	29	26	3.6	N/A	N/A	0	N/A
432	51653	Vasanthi	50	F	1	31.11	1	1	1	1	200	31	24	3.5	0.598	I	2	ND
433	63329	Parimala	60	F	0	28.95	1	1	1	1	180	21	15	3	N/A	N/A	0	N/A
434	98390	Rani	63	F	0	21.63	1	0	0	0	200	59	32	3.2	N/A	N/A	0	N/A
435	24712	Shanthi	52	F	0	29.59	1	1	1	1	200	19	46	5.6	N/A	N/A	0	N/A
436	92828	Vasantha	66	F	0	29.94	1	1	1	1	100	25	21	5.4	1.026	H	2	6.3
437	5642	Varalakshmi	49	F	0	26.22	1	0	0	0	200	19	16	3.1	0.262	I	1	N/A
438	4371	Banu	42	F	0	25.8	1	1	0	1	200	35	21	4.6	-0.552	I	2	4.2
439	74991	Chengan	51	M	1	30.07	1	1	0	1	300	19	16	2.9	-0.47	I	1	N/A
440	2543	Govindammal	50	F	0	23.07	1	0	0	0	100	28	24	4.6	N/A	N/A	0	N/A
441	41028	Annamma	66	F	0	22.32	1	0	0	0	140	24	18	4.2	0.723	H	1	N/A
442	5381	Nithyakalyani	55	F	0	23.93	1	0	0	0	160	22	15	4	N/A	N/A	0	N/A
443	4101	Pramila	60	F	0	25.57	1	0	0	0	180	27	18	3.9	0.65	I	1	N/A

S.NO	H.NO	NAME	AGE	SEX	BP	BMI	WC	HTG	HDL	MS	PLT	AST	ALT	Alb	NFS	RF	USG	FLS
444	104747	Anjalai	36	F	0	24.77	1	0	0	0	300	38	21	3.9	N/A	N/A	0	N/A
445	3856	Valli	58	F	0	28.57	1	1	1	1	140	30	21	3.6	1.505	H	2	ND
446	1150	Valliarasu	53	F	0	22.84	1	0	0	0	180	32	15	4	0.695	H	1	N/A
447	105286	Indrani	43	F	0	20	0	0	0	0	200	36	15	3.6	N/A	N/A	0	N/A
448	106333	Ganesan	54	M	0	24.22	1	0	0	0	240	38	15	3.1	N/A	N/A	0	N/A
449	47	Malarkodi	57	F	1	35.71	1	1	1	1	140	25	14	3.5	2	H	2	ND
450	63609	Rani	55	F	0	24.03	1	1	0	1	280	28	15	3.6	-0.419	I	2	ND
451	91947	Kalyani	55	F	0	23.44	1	1	0	1	120	30	18	4.1	1.077	H	2	5.4
452	5570	Rani	47	F	0	21.08	1	0	0	0	200	32	28	4.2	N/A	N/A	0	N/A
453	89099	Fathimabeevi	67	F	0	29.67	1	1	1	1	260	32	15	3.9	0.881	H	2	ND
454	86011	Rani	63	F	0	24.73	1	1	0	1	180	36	21	3.8	0.96	H	2	ND
455	1209	Kanthammal	65	F	0	22.22	1	1	0	1	160	31	22	3.6	0.888	H	2	5.3
456	1347	Aruna	53	F	0	20.31	1	0	0	0	140	38	19	3.5	N/A	N/A	0	N/A
457	466	Ranjan	57	M	0	26.3	1	0	0	0	300	25	18	4	-1.129	I	1	N/A
458	5780	Sivagami	70	F	0	24.94	1	1	0	1	180	25	18	3.7	0.982	H	2	ND
459	2646	Poonkodi	52	F	0	28.47	0	0	1	0	290	28	15	3.3	0.085	I	1	N/A
460	2915	Parameshwari	52	F	0	25.57	1	1	0	1	140	28	15	3.1	1.765	H	2	ND
461	105143	Sarfunisha	50	F	0	26.16	1	0	0	0	100	38	29	3.7	1.319	H	1	N/A
462	98827	Subedha	55	F	0	27.06	1	0	1	1	160	28	15	3.1	1.756	H	1	N/A
463	6290	Joseph	64	M	0	25.78	1	1	0	1	180	36	18	4.3	1.048	H	2	ND
464	92851	Devika	44	F	1	38.02	1	1	1	1	340	42	31	3.8	-0.93	I	1	N/A
465	1812	Anushya	52	F	1	33.28	1	1	1	1	300	28	15	3.1	0.409	I	2	ND
466	89281	Noorjahan	52	F	0	25.11	1	0	0	0	160	31	22	3.4	N/A	N/A	0	N/A
467	2093	Lally	46	F	1	31.63	1	1	1	1	180	28	31	4	0.044	I	2	ND
468	98123	Chandran	63	M	0	18	0	0	0	0	100	28	15	3.2	N/A	N/A	0	N/A
469	74693	Backiyam	62	F	0	25.33	1	1	0	1	180	31	22	3	1.205	H	2	7.8
470	74054	Parvathy	39	F	0	24.34	1	0	0	0	140	25	18	3.9	0.167	I	1	N/A
471	70610	Samsudin	48	M	1	33.95	1	1	1	1	300	33	28	3.6	-0.687	I	2	ND
472	232	Rashidhabegum	60	F	1	30.13	1	1	1	1	200	28	26	4	0.333	I	2	ND
473	95013	Anjalai	45	F	0	29.21	1	1	1	1	280	34	32	3.8	-1.23	I	1	N/A
474	88274	Helen	66	F	0	24.56	1	1	0	1	160	26	32	4.2	0.524	I	2	7.6
475	67036	Revathy	47	F	0	28.57	1	1	1	1	180	40	36	3.8	0.132	I	1	N/A
476	2176	Kalaiarasi	37	F	1	31.53	1	1	1	1	100	42	40	4	0.887	H	1	N/A
477	63605	Chandra	59	F	0	26.67	1	1	0	1	300	38	33	3.9	-1.189	I	2	ND
478	181	Susairani	43	F	0	23.19	1	0	0	0	200	26	28	3.6	N/A	N/A	0	N/A
479	91413	Valliammal	55	F	0	26.4	1	0	0	0	160	29	27	3.9	N/A	N/A	0	N/A
480	79803	Chinnaponnu	60	F	0	24.44	1	0	0	0	180	20	18	4.2	N/A	N/A	0	N/A
481	5382	Meharbaanbeevi	65	F	0	20.54	1	0	0	0	280	30	31	3	-0.871	I	1	N/A
482	5088	Lakshmi	65	F	0	27.59	1	1	0	1	170	29	28	3.1	1.223	H	2	ND
483	80045	Fathima	58	F	0	22.48	1	1	0	1	320	26	20	3.8	-1.667	L	2	N/A
484	4981	Vellammal	40	F	0	21.93	1	0	0	0	280	38	31	3.7	N/A	N/A	0	N/A
485	32190	Lakshmi	66	F	0	25.45	1	1	0	1	180	29	20	3	1.405	H	2	ND
486	33450	Sarada	50	F	0	26.22	1	1	0	1	160	30	29	3.6	0.338	I	2	10.4
487	1298	Selvi	60	F	1	31.08	1	1	1	1	140	29	20	3.8	1.704	H	3	6.8
488	3456	Vasantha	49	F	1	42.42	1	1	1	1	160	32	30	3.5	1.921	H	3	9.1
489	1245	Sakeela	45	F	1	32.44	1	1	1	1	200	42	31	3.1	0.865	H	1	N/A
490	1815	Anandh	57	M	0	22.31	0	0	0	0	240	31	32	3.1	N/A	N/A	0	N/A
491	1488	Kanagavalli	58	F	0	24.56	1	0	0	0	160	24	22	3.4	N/A	N/A	0	N/A
492	67081	Nageshwari	50	F	0	16	0	0	0	0	400	25	20	3.2	N/A	N/A	0	N/A
493	99701	Vasantha	55	F	0	27.43	1	1	0	1	180	18	15	3.1	0.87	H	2	6.3
494	6647	Malliga	63	F	0	23.61	1	1	0	1	260	28	20	3	0.031	I	2	7.8
495	103530	Azad	55	M	0	27.43	1	1	1	1	400	29	32	3.9	N/A	N/A	0	N/A
496	1706	Md.Hussain	56	M	0	25.22	1	0	0	0	350	20	16	3.6	N/A	N/A	0	N/A
497	48656	Rajeshwari	57	F	0	28.36	1	1	1	1	160	21	18	3.2	1.193	H	1	N/A
498	69425	Layala	50	F	0	29.55	1	1	1	1	200	18	16	3.7	0.154	I	1	N/A
499	50182	Ameenabeevi	60	F	1	33.2	1	1	1	1	240	22	20	3.2	0.653	I	2	10.3
500	375	Violet maria	60	F	0	25.11	1	1	0	1	150	26	28	3.8	0.497	I	2	6.3

KEY:

S.NO:serial number, H.NO:hospital number, M=Male ,F=Female, BP (BLOOD PRESURE>135/85mmhg), N/A=NOT APPLICABLE, PRESENT=1, ABSENT=0, BMI=Body Mass Index in kg/m2, WC=WAIST CIRCUMFERENCE M>90CM, F>80CM for central obesity, HTG=HYPERTRIGLYCERIDEMIA ,HDL= High density lipoprotien LOW= M<40, F<50, MS=Metabolic syndrome, PLT=Platelet count in(10^9/L) AST=Aspartate aminotransferase, ALT=Alanine aminotransferase ,Alb=Albumin, NFS=NAFLD Fibrosis score, RF=RISK OF FIBROSIS(L=LOW,I=INDETERMINATE,H=HIGH), USG =Ultrasound ABDOMEN -FATTY LIVER GRADE(0=NO ,1=GRADE 1,2=GRADE 2,3=GRADE 3), FLS=FIBROSCAN FINDINGS(liver stiffness in kPa), ND=NOT DONE.